

THE NEMESTRINIDAE (DIPTERA) OF THE AUSTRALASIAN REGION.

By I. M. MACKERRAS, B.Sc., M.B., Ch.M., Linnean Macleay Fellow of the Society in Zoology.

(From the Department of Zoology, University of Sydney.)

(Plate 1 and seventeen Text-figures.)

[Read 25th November, 1925.]

	Page.
Introduction	489
The genus <i>Trichophthalma</i>	492
Definition, 492; Morphology, 493; Distribution, 501; Habits, 506; Systematics and Keys, 507; Description of species, 510.	
The Genus <i>Exeretoneura</i>	545
The Genus <i>Trichopsidea</i>	548
The Genus <i>Atriadops</i>	551
The Genus <i>Nycterimyia</i>	553
The Genus <i>Nycterimorpha</i>	556
The Genus <i>Cyclopsidea</i>	557

Introduction.

The essential basis of zoogeographical studies is an accurate knowledge of the affinities of animal groups from different regions. A careful study of the available literature shows that in the Nemestrinidae, as in many other Diptera, the information as to generic relationships, while highly suggestive, is not conclusive. The first object of this work, then, is to place in the hands of workers who have the material from other regions, especially the Neotropical, a study of the Australasian members of this family sufficiently detailed for accurate comparative work. At the same time, a careful systematic review has been made and all available information about the Australasian species has been given in order to enable Australian dipterists to recognize the known species and to pave the way for further systematic work and the study of various local problems.

The first study of Australian material was made by Westwood (1835), who erected the subgenus *Trichophthalma* for the reception of three species, two undoubtedly, and probably all, Australian. He was followed by several workers, notably Macquart and Walker, who described a number of Australian species, placing them in various genera. The latter appears to have been the first to raise *Trichophthalma* to full generic rank. The first work of a revisional character was undertaken by Wandolleck (1897), who dealt with the genera *Trichopsidea* and *Atriadops* in considerable detail. Later, Lichtwardt (1909, 1910a, 1912) dealt with the Australian species as fully as material permitted in the course of his review of the Nemestrinids of the world. In this country White (1914, 1916) and Hardy (1924) are the only workers who have dealt with the family. The latter reviewed the taxonomy of the Australian species, described new antennal characters and gave brief notes on many of the species. His work and also that of Lichtwardt have been of the greatest assistance in the systematic side of the present study.

Six genera have been described for Australasia and 40 specific names used. Of these I consider 22 as definitely valid and 2 I cannot place, one of which is the genotype, *T. bivittata* Westw. All the valid species of which I have material are redescribed in detail and the original descriptions are also given, so that other workers may be able to check my conclusions without difficulty. These detailed descriptions are especially necessary in the genus *Trichophthalma*, the species of which are often to be separated with certainty only by a careful comparison of all the characters. Fifteen (15) species, 3 subspecies and 1 variety of this genus are here described as new, the number of species in each genus being as follows for this region: *Trichophthalma* 30, *Exeretoneura* 2, *Trichopsidea* 1, *Atriadops* 1, *Nycterimyia* 2, *Nycterimorpha* 1, the total being 37 species for the family, a number which will undoubtedly be increased considerably as more extensive collections are made, especially in Western Australia and South Australia and in North Queensland and the adjacent islands. Since the above was written, I have received a note from Mr. Hardy stating that he has discovered a new and very interesting genus, which is described below.

Of the six genera, four are endemic, *Atriadops* and *Nycterimyia* being also represented in other regions. *Trichopsidea* and *Nycterimorpha* are closely related to these two and form with them a group which has obviously reached Australia from the Oriental Region and which is, equally obviously, the most specialized of the Australian Nemestrinidae. These flies are rare, the number, both of species and of individuals, being very small. All occur on the mainland and the first three are also known from New Guinea, *Trichopsidea* also extending as far south as Tasmania. No Nemestrinid is yet known from New Zealand.

The genus *Trichophthalma* stands in marked contrast with those just described. While showing many archaic characters, it is yet the dominant and successful genus in this region, being found commonly in every part of Australia and in every climatic environment where suitable food plants occur, with the possible exception of North Queensland where members of this genus appear on present knowledge to be rather rare. It is not known from the drier parts, possibly owing to the absence of suitable flowering shrubs, or possibly because of a direct effect of aridity. It is abundant on the mainland of Australia and extends to Banks Is. in the north and to Tasmania in the south. No specimens are yet known from New Guinea. Its closest affinities appear to be with the Chilean genus *Eurygastromyia* Lichtwardt.

Such cases of animals which are archaic and are found in a peripheral region, but which are nevertheless highly successful, are difficult to explain by the central thrust idea which underlies Matthew's (1915) theory of radial dispersal, at any rate as applied to the Diptera Brachycera. The facts are that the *Trichophthalmas* form part of an important and conspicuous dipterous fauna which has its nearest allies in South America and which dominates a particular environment in eastern Australia, namely the southern and the mountain areas. It must be remembered also that Wallace's Line has proved no barrier to the invasion of more recent highly specialized and successful species from the Oriental Region, and that the "Antarctic" element has been able, not only to survive and flourish in a particular part of the country, but sometimes, as with the *Trichophthalmas*, to invade successfully those areas which are most suitable for the development of the Oriental element. Many of these Antarctic types are primitive, but they cannot be considered in any sense unsuccessful. Primitiveness and non-success do appear to go hand in hand in the mammals, but it is a

great mistake to apply the same conclusions to the insects. Primitive characters are only retained in the Diptera Brachycera because they are of more use for a particular purpose than more specialized ones. No one could doubt that the primitive venation of the *Trichophthalmas*, by a slight rearrangement in the directions of veins, is made much more suitable for the particular type of flight of these insects than could be possible in any more specialized and reduced venational type, and it is a fact that, of all Australian Diptera that indulge in the hovering type of flight, the *Trichophthalmas* are the most efficient. It is a most beautiful case of the utilization of primitive structures by a very slight modification for a highly specialized type of activity, and is of value to the student of phylogeny, but useless to explain distribution. Besides forming a prominent element of the Australian dipterous fauna, and besides competing successfully with the more specialized Oriental element, not only in their own but in other families, the *Trichophthalmas* have adapted themselves to a number of different environments, some of which certainly have analogues in other regions; and it is difficult to conceive that they would not have survived had they ever occurred elsewhere than in the Australasian and the Neotropical Regions, since it is strongly indicated that they are also represented in the latter by the Chilian genus *Eurygastromyia*.

The only hypothesis which would fit in with the theory of Matthew is to assume that the ancestors of the *Trichophthalmas* were unsuccessful and were driven into the remote parts of the earth where they met with stimulating conditions, and there is no doubt that southern Australia was just as stimulating in the past as was the Palaeartic Region, and developed into the successful genus we now know, the same happening to their relatives of the same zone of migration which reached South America. This is a pure assumption and has, to my mind, on the evidence before me, less to recommend it than the theory that South America was joined to Australia by Antarctica, and the suggestion that the primitive Nemestrinids spread all over the world (the period of such spreading would correspond very well with a time of fairly uniform climate in the last of Griffith Taylor's major climatic cycles—Taylor, 1919) and developed independently into the various groups now found, the Chilian *Eurygastromyia* and the Australian *Trichophthalma* originating in the south from a common ancestor. It is hoped to elaborate this point at a later date in a more general survey of the distribution of the Australian Diptera Brachycera.

The whole question hinges on the degree of relationship of the genera from the different regions. The available information strongly indicates a close affinity between the two genera mentioned, but it is not absolutely conclusive, although paralleled by other similar cases, nor is there sufficient information as to the affinities of these forms with genera from other regions. It is not possible to carry out such studies in Australia and all that can be done here is to attempt to supply a reasonable basis for comparative work for one region only, leaving the question of inter-regional relationships strongly suspected, though not proven. Whatever its relationships and whatever light they may throw on a possible Antarctic radiation, there is no doubt that *Trichophthalma* is an archaic yet highly successful genus, the presence of which in a peripheral region is difficult to account for on an hypothesis of central thrust by better adapted species.

The remaining genus, *Exeretoneura*, is an archaic one, the affinities of which are doubtful. Its distribution in Tasmania and in the eastern highlands of Australia indicates that its nearest relatives will probably be found in South America.

The material before me comprises 850 specimens, many of the species being represented by long series from several localities. It is only this abundance of material which has made it possible to carry our knowledge of this family further than Hardy (1924) has already taken it, and I wish to express my very grateful thanks to the following institutions and individuals for the use of material and to the latter for much assistance in the field and in other directions: The Queensland Museum, Brisbane; The Australian Museum, Sydney; The Macleay Museum, University of Sydney (which includes the valuable collection made at Barrington Tops, N.S.W., by Professor Harrison and the members of his expedition); The National Museum, Melbourne; The South Australian Museum, Adelaide; The Entomological Branch, Dept. of Agriculture, N.S.W.; Dr. T. L. Bancroft, Dr. E. W. Ferguson, Mr. G. M. Goldfinch, Mr. G. H. Hardy, Professor L. Harrison, Mrs. I. M. Mackerras, Miss L. Wood. To Mr. A. J. Nicholson my gratitude is also due for permission to publish his excellent photographs of the living insects which appear in Plate I, and to Mr. A. Musgrave for Text-fig. 1. I am also much indebted to Professor T. Griffith Taylor for advice on questions of geography and climatology.

Key to Australasian Genera.

1. Proboscis prominent, at least as long as head, R_{4+5} forked . . . *Trichophthalma* Westw.
Proboscis inconspicuous and much shorter than head, or vestigial 2
2. R_{4+5} forked, proboscis Leptid-like *Exeretoneura* Macq.
 R_{4+5} not forked, proboscis vestigial 3
3. M_1 and M_2 at least partly separated distal to oblique vein 4
 M_1 and M_2 completely fused distal to oblique vein 5
4. M_1 and M_2 fuse before reaching wing margin, wings clear, ocelli present
. *Trichopsidea* Westw.
 M_1 and M_2 separate to wing margin, wings brown, ocelli absent *Atriadops* Wand.
 M_1 and M_2 separate to wing margin, wings clear and hind angle absent, ocelli present *Cyclopsidea*, n. gen.
5. Hind angle of wing well developed, venation not unusual *Nycterimyia* Licht.
Hind angle of wing absent, venation and shape of wing very peculiar
. *Nycterimorpha* Licht.

Genus TRICHOPTHALMA Westwood.

Nemestrina subg. *Trichophthalma* Westwood, 1835, p. 448.—*Hirmoneura* Meig., in part; Macquart, 1840, 1846, 1850; Jaenicke, 1867.—*Rhynchocephalus* Fisch., in part; Newman, 1841.—*Trichophthalma* Westw.; Walker, 1849, 1857; Bigot, 1881; Lichtwardt, 1910a, p. 371; White, 1914, p. 65; Hardy, 1924, p. 449, figs. 1, 6, 7.

Definition.

Eyes large, contiguous or narrowly separated in the male, slightly more separated in the female; covered with dense long hairs; ocelli present. Proboscis elongate; palpi small but well developed. Antennae with basal segments small, cylindrical; third segment larger, conical or sub-cylindrical; style long, three-segmented. Wings with R_{4+5} forked, no inter-radial *c-v*, M_{1+2} only just meeting R_{4+5} , M_1 and M_2 separate, M_1 fused with M_2 to form tip of oblique vein, C continuous all round wing margin. Genitalia with well developed basistyles and separated median part of ninth sternite, distostyles and basi-distostyles also prominent; aedeagus not fused with other parts to a marked extent; anal lobes small, membranous. Lamellae of ovipositor not greatly elongate.

Genotype, *Trichophthalma bivittata* Westwood, 1835.

Hardy (1924, p. 450) named *costalis* Westw. as the genotype, overlooking the fact that Lichtwardt (1910a, p. 371 and 1910b, p. 601) designated the first described species, namely *bivittata* Westw. as the genotype. Lichtwardt's designa-

tion is unfortunate as this species cannot be placed at present; still it is quite unequivocal and so must stand. It is possible that the type is in the British Museum and that it will prove on examination to be a species which is at present well known under another name.



Text-figure 1.—*Trichophthalma rosea* Macq. ♀ × 2. (Photo.—A. Musgrave).

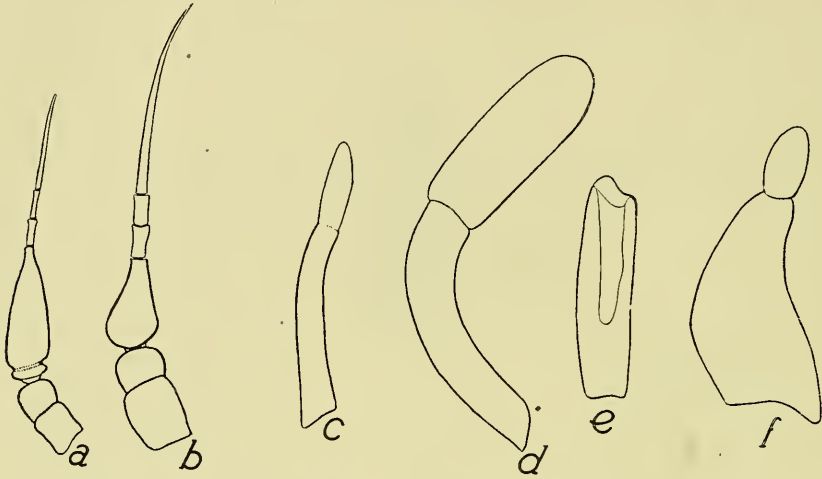
Morphology.

For reasons detailed above it is proposed to deal here in considerable detail with those characters of taxonomic and general morphological importance. In general, these are very active flies, of large to fairly small size and of stout to moderate habit. They bear a rather close superficial resemblance to certain Tabanids, especially those of the genus *Pelecorhynchus*. The general appearance of one type is well shown in Text-fig. 1 and in Pl. 1. On the available information this genus is only to be separated from *Eurygastromyia* Licht. by the different shape of the head and by the longer proboscis and much broader abdomen of the latter. It has been possible to divide the genus into groups, subgroups and series on characters that are readily accessible. This arrangement has been followed, rather than the simpler one of merely making a number of groups, in order to stress the degree of relationship of the various species. This grouping not only simplifies the discrimination of species, but rationalizes our studies of problems of local distribution. While the group characters used are of greater value than those separating many "genera" of Tabanidae, the genus forms such a natural homogeneous whole that it is not thought advisable to propose even subgeneric separation.

Antennae.

Hardy (1924, p. 451) has pointed out that the genus may be divided into two groups on characters provided by the third segment of the antenna. In the first

group (Text-fig. 2*b*) this segment is short and conical and is not divided into two parts by a sulcus near its base; the majority of the species belong here and I have called it the *costalis* group. In the second group (Text-fig. 2*a*) it is elongate, more parallel sided and is distinctly divided by a groove near its base; this forms the *rosea* group. This grouping is eminently natural and forms the primary subdivision of the genus, being supported by differences in body form and in several important structural characters.



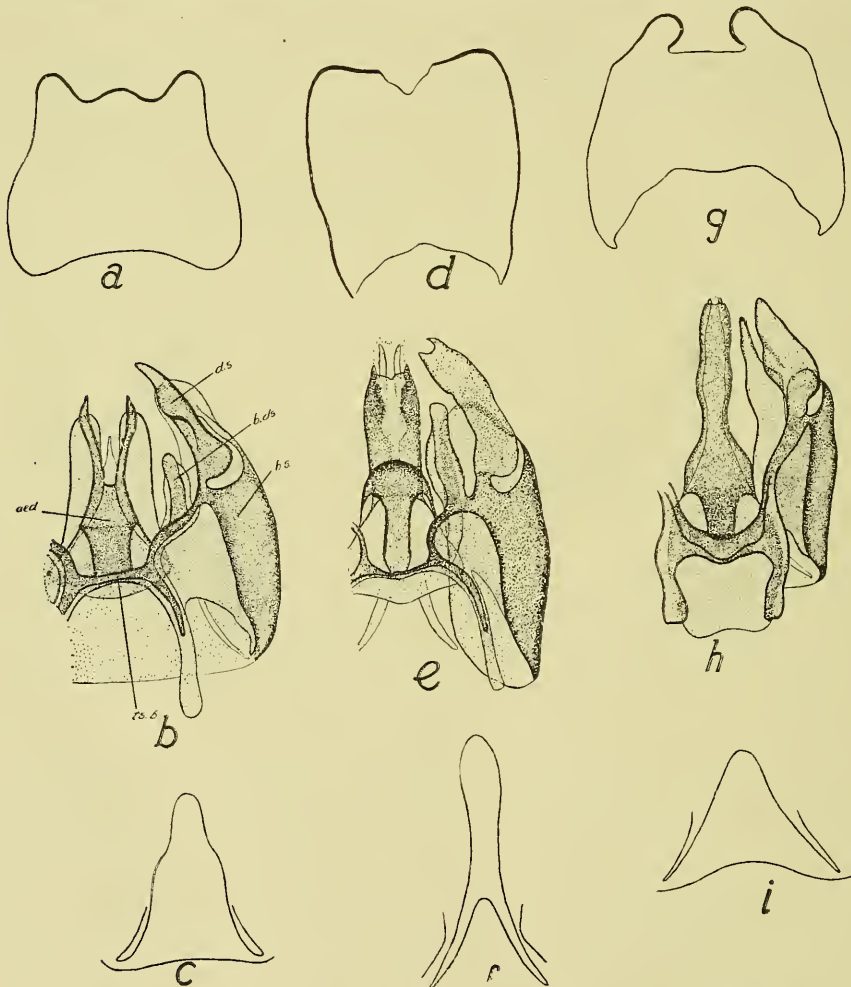
Text-figure 2.—*a*, Antenna of *T. rosea* Macq.; *b*, Antenna of *T. novae-hollandiae* Macq.; *c*, Palp of *T. costalis* Westw.; *d*, Palp of *T. novae-hollandiae* Macq.; *e*, Distal segment of same showing apical pit; *f*, Palp of *T. rosea* Macq. *a*, *b* and *e* are from cleared preparations. *a* and *b* are much less magnified than *c*, *d*, *e* and *f*.

Mouth parts.

The proboscis is as long as, or usually longer than, the head, and its length and stoutness, together with the size of the labellae, are often of use in the separation of species. It must be remembered, however, that the proboscis is more or less extensible, so there may be quite marked differences between specimens of the same species. Differences in stoutness, and especially in the size of the labellae, are much more reliable, unless the difference in length is very marked. The mouth parts in both sexes have a strong resemblance to those of the male Tabanid, the mandibles being absent or represented by a short spike which is inconstant in its occurrence, while the maxillae, hypopharynx and epipharynx are elongate and stylet-like. The labium and labellae are also precisely similar to the Tabanid.

The palpi afford a ready means of dividing the *costalis* group into two subgroups. In the *costalis* subgroup the basal segment is long and slender and the apical, which is only indistinctly separated, is short and tapers to a rounded apex in which there is a deep pit, the mouth of which may be difficult to see; the palp is never very densely haired, nor so buried in the facial hairs as not to be clearly visible. The species related to *T. punctata* Macq. have a definitely slenderer, more pointed palp than is seen in *T. costalis* Westw. and its immediate allies. In the *novae-hollandiae* subgroup (Text-fig. 2*d* and 2*e*) the palp is large

to me. The oblique vein has the composition: R_s , R_{4+5} , $r-m$, M_{1+2} , M_{2+3} , M_3 , M_{3+4} . R_{4+5} in general just touches M_{1+2} , but in a few cases $r-m$ is not quite eliminated and may just be detected; a similar statement applies to $m-cu$, though this crossvein is more usually recognizable. A useful character is found in the tip of the oblique vein, which is made up of M_{3+4} . In the *costalis* group it is almost continuous with the rest of the oblique vein; in the *rosea* group, on the other hand, it is displaced back, usually to a considerable extent, towards the root of the wing (compare Text-fig. 3b with Text-fig. 3c). As in the case of the palpi, *T. lactilinea* Walk. and *T. ricardoae* Licht. show an intermediate condition, nevertheless the displacement is more marked than in any of the *costalis* group.



Text-figure 4.—Genitalia in the genus *Trichophthalma*; top, ninth tergite, middle, dorsal view of parts seen after removal of ninth tergite, bottom, ninth sternite; the ninth tergite is drawn at a smaller magnification than the rest. *a*, *b*, *c*. *T. costalis* Westw., *d*, *e*, *f*. *T. nigrovittata*, nov., *g*, *h*, *i*. *T. rosea* Macq. Lettering of parts in text.

Certain venational aberrations have been met with in some species and these are worth recording here. Macquart mentions, when describing *H. nigri-ventris* (= *T. punctata* Macq.), the presence of an accessory vein crossing cell R_3 on one side only in one of his specimens which he illustrates (Macquart, 1850, p. 98, Pl. 9, fig. 9). I have not seen this vein, but an accessory crossvein crossing cell M_1 is frequent on one or both sides in *T. primitiva* Walk.; in some cases two crossveins are present in this situation. This vein is also present in one specimen of *T. rosea* Macq. and in one of *T. confusa*, nov., on one side only in each. Usually it is situated near the middle of the cell, but in the specimen of *T. confusa*, nov., it is close to the base. In one specimen of *T. nigrovittata*, nov., there is a short stump leaving M_1 and ending in the field of the wing between M_1 and M_2 . Cell M_1 is sometimes closed completely at its apex or markedly narrowed in *T. rosea* Macq. Finally, in the unique female of *T. grisea*, nov., which has only one wing intact, M_{2+4} is completely absent, M_4 and M_3 forming a continuous unbroken line a little distance from the margin of the wing, a condition resembling that found in the Palaearctic *Rhynchocephalus tauscheri* Fisch. Accessory veins near the posterior margin of the wing also occur in *Atriadops javana* Wied.

Male genitalia.

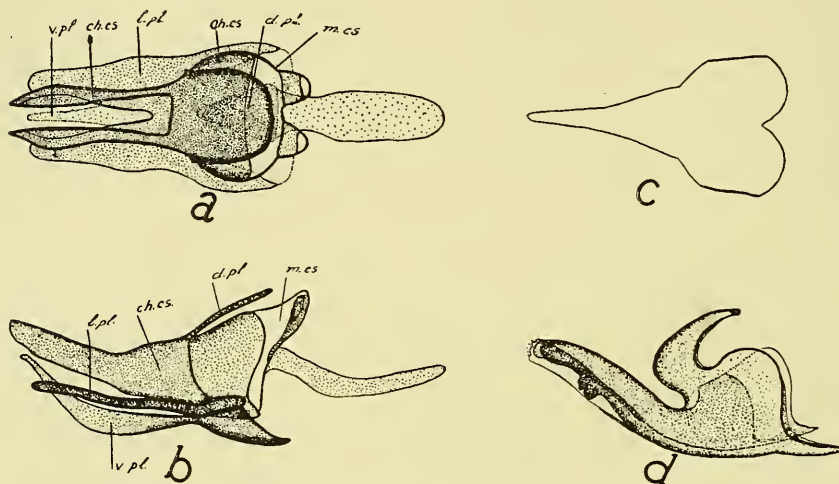
A study of these parts has been of the greatest assistance in confirming the division of the genus into groups and subgroups on other characters and, in certain cases, in the separation of closely related species. With the information now available, it is not often necessary to dissect these parts, as we know the constancy of the other characters, and the shape of the ninth tergite, which can almost always be seen without dissection, is usually sufficient for taxonomic purposes. Nevertheless, any doubtful species should be dissected and examined in detail. The apparatus comprises the ninth tergite and sternite with its appendages, together with the parts lying between them, namely the tenth segment and anus dorsally and the aedeagus enclosing the transmitting organs ventrally.

The *ninth tergite* (Text-fig. 4, *a, d, g*) is heavily chitinized, more or less quadrilateral in shape, covered dorsally with long hairs, and lies arched over the other parts which it covers in completely. The shape of its distal end is, with few exceptions, characteristic for each group, and also differs in detail in the members of the *punctata* series.

The *ninth sternite* (Text-fig. 4, *c, f, i*) is nearly completely separated off from the basistyles and is developed posteriorly into a finger-like process, which is covered ventrally with soft hair. Its shape and extent differs in the three major divisions, being smallest in the *rosea* group, longest and most slender in the *novae-hollandiae* subgroup and intermediate in the *costalis* subgroup. It is constant in each and does not appear to show specific differences of value within a group or subgroup. This well developed type of sternite, which is separated off from the basistyles, is markedly different from the condition usually met with in the Tabanoidea, the sternite generally forming a strong bar from which the basistyles arise by a broad zone of attachment.

The *basistyles* or claspers (Text-fig. 4, *b, b.s.*) are very well developed. Each is deeply notched proximally, the medial side of the notch being produced into the body as a strong strut for the attachment of muscles. A transverse bar, the morphological posterior end of the ninth sternite (Text-fig. 4, *b, ts.b.*), joins the two basistyles together dorsally and gives attachment to the aedeagus. The

distal end is produced much further ventrally than dorsally. The *distostyle* (Text-fig. 4, *b*, *d.s.*) is attached to the basistyle dorsally and overlies its ventral projecting part; its shape is often of use in the separation of species. Lying between the basistyle and the aedeagus is a process composed of a dorsal and ventral lamina, both of which are attached proximally to the medial aspect of the basistyle (Text-fig. 4, *b*, *b.ds.*). Its homologies are somewhat doubtful, but I am calling it the *basi-distostyle*, although it is quite possibly not the homologue of the structure so named in the Nematocera. The size of this structure is constant for each division and the differences can be best appreciated from a study of the figures.



Text-figure 5.—*a*, dorsal, *b*, lateral, view of aedeagus of *T. rufonigra*, nov.; *c*, ventral plate of same; *d*, lateral view of aedeagus of *T. nigrovittata*, nov. *v.pl.* ventral plate, *ch.cs.* chitinized part of copulatory sac, *l.pl.* lateral plate, *d.pl.* dorsal plate, *m.cs.* membranous part of copulatory sac.

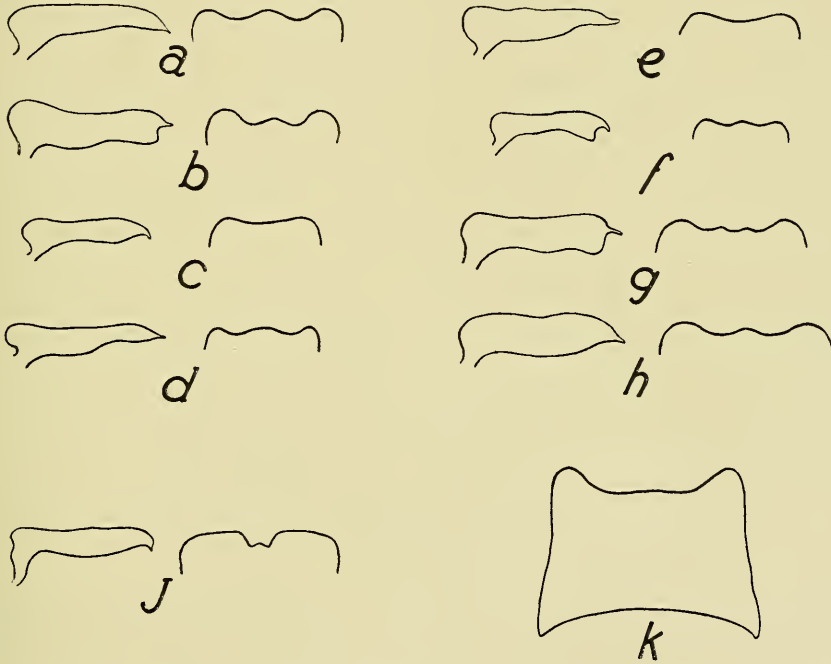
The *aedeagus* in the *costalis* subgroup (Text-fig. 4, *b*, *aed.*) is composed of dorsal, lateral and ventral plates and the chitinized part of the copulatory sac, which is deeply incised distally. The dorsal plate is attached proximally to the transverse strut joining the two basistyles, while distally it becomes fused with the chitinized part of the copulatory sac; this is the only chitinous attachment in this genus of the aedeagus to the other parts of the genitalia. The relations of these parts are shown in Text-fig. 5, *a* and *b*. The proximal part of the copulatory sac is membranous with two small patches of chitin for muscle attachment. The transfer apparatus (seen dimly beneath the dorsal plate in Text-fig. 5, *a*) is cone-shaped and is produced proximally into a stout strut for the attachment of muscles. In the *novae-hollandiae* subgroup the chitinized parts are fused in such a way that their individual identity is difficult to make out, and the lateroventral aspect, which consists of the down-turned lateral edges of the lateral plates, usually bears teeth. The dorsal element is produced into a prominent bulb overhanging the tubular distal part (Text-fig. 5, *d*). In the *rosea* group the fusion is complete, the distal part forming a simple tube; there are some specific differences in the aedeagus of this group (see Text-fig. 9).

The tenth segment is fairly well developed and the anal lobes are membranous and short, differing markedly from the condition found in *Trichopsidea* and *Atriadops*.

The outstanding characters of each type of genitalia may be summarized as follows:

costalis subgroup (Text-fig. 4, *a, b, c*): Genitalia broader than long. Distal end of ninth tergite sinuous (except *T. fusca*, nov., which resembles the *novae-hollandiae* subgroup). Ninth sternite broad and produced into a short median lobe. Distostyle of variable shape, but never resembling those found in the other divisions. Basi-distostyle short, never as long as the ventral part of the basistyle. Aedeagus made up of separated bars of chitin, proximal part never forming a bulb overhanging the distal slenderer part.

novae-hollandiae subgroup (Text-fig. 4, *d,e,f*): Genitalia longer than broad. Distal end of ninth tergite with a triangular notch (except *T. nigripes* Macq.).



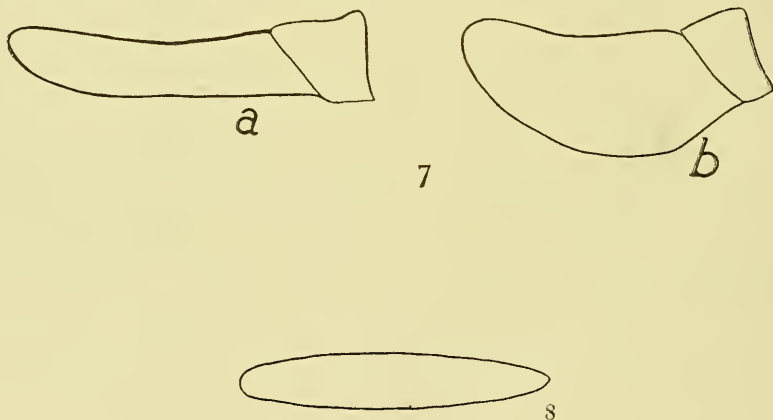
Text-figure 6.—Distostyle (left) and distal end of ninth tergite (right) of—*a, T. punctata punctata* Macq.; *b, T. punctata orientalis*, nov.; *c, T. fulva* Walk.; *d, T. confusa*, nov.; *e, T. bivitta nigricosta*, nov.; *f, T. harrisoni*, nov.; *g, T. nicholsoni*, nov.; *h, T. leucophaea* Walk.; *j, T. fusca*, nov.; *k, ninth tergite of T. nigripes* Macq.

Ninth sternite long and slender, distostyle with a deep notch in its distal end. Basi-distostyle of medium size, just reaching as far as ventral part of basistyle. Parts of aedeagus fused to form a tube, incomplete ventrally; proximal wider part forming a bulb overhanging the distal part. Ventral aspect bearing stout teeth on each side (except *T. nigripes* Macq.). This species differs markedly

from the rest of the subgroup in the shape of the ninth tergite and in the absence of teeth on the aedeagus, but agrees in all other characters and does not warrant separation into a distinct subgroup.

rosea group (Text-fig. 4, *g, h, i*): Genitalia longer than broad. Distal end of ninth tergite with a deep notch with overhanging sides. Ninth sternite very small, hardly projecting beyond the point of closest approximation of the basistyles to each other. Distostyle bulky, of characteristic shape. Basi-distostyle very large, projecting as far as the apex of the distostyle or nearly so. Aedeagus completely fused to form a slender tube, basal part forming a bulb overhanging the distal part in most species, not in all; no teeth on ventral aspect.

In regard to the separation of species within a group, one may state that in the case of one or two species, notably *T. fusca*, nov. and *T. nigripes* Macq., the genitalia are absolutely characteristic, but the majority do not show striking specific differences. In the *punctata* series of the *costalis* subgroup, there are small differences in the shape of the distal end of the ninth tergite and of the distostyle, which, rather than clearing up the question of the species of this series, have made it considerably more complicated, but much more interesting.



Text-figure 7.—Lamellae of ovipositor seen from the side of—
a, T. bancrofti, nov. and *b, T. rosea* Macq.

Text-figure 8.—Egg of *T. rosea* Macq.

These differences are shown in Text-fig. 6 and are small, but easily seen in mounts, and they are quite constant throughout quite good series of the various species and varieties. It will be seen from the figure that *T. punctata punctata* Macq. and *T. punctata orientalis*, nov., differ in the shape of the distostyle, whereas *T. harrisoni*, nov. and the first named are closely similar. The first two are much alike in coloration and markings (at least there is a continuous series), while *T. harrisoni* differs markedly from either. On the other hand, *T. harrisoni*, nov., closely resembles *T. bivitta bivitta* Walk., but differs from it in genitalia. These differences would not be worthy of much consideration were it not for the fact that all the evidence strongly indicates that they are quite constant, and for the interesting distributional questions raised. The whole series is very difficult and much more extensive material must be investigated before definite conclusions can be reached. The arrangement here given represents a

distinct advance in our knowledge of this series, but it must be understood that it is only tentative and may require considerable modification before finality is reached.

Female genitalia.

The lamellae of the ovipositor not only offer interesting evidence of generic relationships, but also supply a character by which the *rosea* group may be separated from the rest of the genus. In the *rosea* group (Text-fig. 7, b) each lamella is flattened and leaf-like and is short and broad in side view. In the other species it is more elongate and parallel-sided and is curved so that the apposition of the two lamellae forms a longitudinal tube. The members of the *costalis* subgroup in general have much shorter lamellae than do those of the *novae-hollandiae* subgroup, but the difference is not sufficiently marked to form a useful character.

Coloration and markings.

For the separation of many species one must rely on small differences of colour and pattern, and to a small extent on differences in size and general body shape. This renders descriptive work rather difficult, because one frequently finds that two series are obviously distinct when placed side by side, and yet it is almost impossible to give an adequate word picture of the differences between them. A careful study of a long series of a number of species points definitely to two conclusions: firstly, that the coloration and pattern of specimens of a given species from the one locality are in general remarkably constant, and secondly, that specimens of a species from one locality often differ markedly from those from another area. An important fact bearing on the justifiability of using these characters is that several very closely related species may occur in one locality. For example, at Barrington Tops several closely related species of the *punctata* series were taken, all occurring at the same time in the same situation. In the case of three of these we have sufficient numbers to demonstrate their uniformity. In the absence of any linking forms, one feels bound to give them separate specific rank, and it seems reasonable to extend our conclusions, based on this and other experiences of the uniformity of various species, to those of which we have but few specimens.

The sexes are often similar in appearance, but in many species there is more or less dimorphism, and in such cases it is frequent to find that the males are readily separable, while the females are difficult to distinguish (e.g., *T. rosea* Macq. and *T. cques* Schin.). There is rarely any very great variation in size, long series sometimes showing not more than a millimetre or two difference, and in such cases the finding of one or two very small individuals may raise the suspicion that one is dealing with a distinct species. One has, however, refrained from using size alone as a character of value, although it is often useful for purposes of quick identification, as in the case of *T. fusca*, nov., which may be separated at a glance from its allies by its very small size.

Distribution.

Two distinct sets of facts are here discussed: firstly, the distribution of the various species throughout Australasia, and secondly, the seasonal distribution, about which there is some interesting information. These will be taken up separately. Apart altogether from its interest in relation to a possible Antarctic

connection with South America, the genus *Trichophthalma* is one of the most suitable in the whole Diptera Brachycera for the study of local distributional problems. The very plasticity which makes systematic work so difficult, takes on an added interest when looked at from the point of view of the effect of isolation and of varied environment. Studies of the distribution of, and relationships between, species in different parts of Australia also lead to interesting conclusions which may have a more general application. It is necessary, however, to emphasize that, although practically all the material in Australia has passed through my hands, the available evidence does not permit of more than tentative conclusions being expressed, and these are put forward here to interest others in their investigation rather than in their possible application.

The evidence strongly indicates that the centre of recent development of the genus is in eastern New South Wales, whence it has spread to Banks Island in the north, to Tasmania in the south, and also to the south-western corner of Western Australia. The last mentioned area presents certain special features, which will be taken up later, the western limit for the present purpose being taken as the eastern half of South Australia. This dispersal from an eastern centre is best demonstrated by considering the fauna of each of the States separately.

The part of New South Wales especially to be considered includes the Eastern Divide and the country to the east of it. Twenty of the thirty known species occur in this area and the number of individuals greatly exceeds two-thirds of the whole collection. One species, *T. fusca*, nov. and one subspecies, *T. punctata punctata* Macq. are only known from west of the Divide and really belong to other States, but the remainder are dominantly New South Wales species. This part of the country may be divided into two areas, the highlands and the coastal zone, presenting different conditions and showing marked differences in their faunas. The *rosea* group is practically restricted to the coast, only occasional specimens of *T. albimacula* Walk. and *T. laetilinea* Walk. being known from the mountains. The *novae-hollandiae* subgroup is well known both from the coast and from the mountains and also extends a little to the west of the Divide. These flies are, however, much more abundant on the mountains and *T. nigrovittata*, nov., is not known from the coast as yet, although it occurs on the coast of Queensland. *T. costalis* Westw. is equally prevalent in both areas, but the series in general is a dominantly mountain one, as is also the *punctata* series, although two species, *T. bivitta bivitta* Walk. and *T. confusa*, nov., are purely coastal. The first is represented in the mountains by *T. bivitta nigricosta*, nov., but nothing corresponding to *T. confusa*, nov., has yet been found there. An important fact bearing on this distribution and on the differences in prevalence of the different species at different times is that at the beginning of the season there is an abundance of attractive flowering plants on the coast and few or none on the mountains, while, later on, the highlands are rich in *Leptospermum*, the most attractive of all, while the coastal flowers are not so numerous or so attractive. This seems to be the most important factor underlying the differences in prevalence, but there is also evidence of a direct climatic influence, a fairly moist climate with mild temperatures being most favourable. In general, spring on the coast and midsummer on the mountains present fairly similar conditions and in both the *Trichophthalmas* abound, but the faunas of the two are quite distinct, the first having only the *rosea* group, while the second has all the rest. The coastal fauna in the middle of summer consists mainly of

the hardier of the species common on the mountains, together with a small special development.

Queensland possesses ten of the New South Wales species, which gradually die out as one proceeds north, the *rosea* group reaching the Johnstone R. (*T. eques* Schin.), the *costalis* subgroup extending as far as the Endeavour R. (*T. punctata orientalis*, nov.), while *T. novae-hollandiae* Macq. extends as far as Banks Island. Three of the species in this State are not known from New South Wales; *T. bancrofti*, nov., is nearly related to *T. novae-hollandiae* Macq. and is not yet known south of Brisbane. While it may turn up later in New South Wales, there is no room for doubt that it is typically a Queensland species, as is probably also *T. fusca*. Of the other two species, *fulva* Walk. and *intermedia*, nov., our knowledge is too scanty to warrant their consideration. In general the Queensland fauna is a very impoverished replica of that of New South Wales, except that the *novae-hollandiae* subgroup reaches as great, or possibly a greater, degree of development.

The Victorian fauna is also an impoverished one, there being only eight species known, all but one variety being typical New South Wales forms. The case of *T. punctata* Macq. is interesting; subspecies *orientalis*, nov., is abundant in eastern New South Wales and rare in Victoria, while subspecies *punctata* Macq. is known only from one specimen from west of the Divide in New South Wales, but is not uncommon in Victoria. Tasmania possesses only *T. punctata punctata* Macq., this species being abundant there. This State has been sufficiently well collected to make it certain that the other species are exceptionally rare, if they occur at all. It is a matter of considerable interest that the marginal forms, *T. novae-hollandiae* Macq. in the north and *T. punctata* Macq. in the south, are not primitive unsuccessful species pushed to the periphery, but amongst the most successful, numerous and wide-spread in the whole genus. There is every indication of a radial dispersal from eastern New South Wales of a type that is the reverse of that which holds good for the mammals, which is unexpected, for it is difficult to understand why this genus should not repeat in miniature what is said to hold good on a larger scale in other groups.

South Australia in turn has only a very small number of the New South Wales species, only three, or possibly four, of these being known; in addition the Tasmanian *T. punctata punctata* Macq. also extends as far as South Australia. There is, however, a greater development of endemic species, which is what one would expect owing to the greater distance from the centre. *T. subcostalis*, nov., probably replaces the eastern *T. rufonigra*, nov., and *T. griseolineata*, nov., is the South Australian representative of the *nicholsoni* type, while *T. variolosa* Licht. cannot be placed at present, but links up with *T. eques* Schin. or *T. albimacula* Walk.

The Trichophthalma fauna of Swanland, or south Western Australia, is very interesting, but at present very scanty, there being only six species recorded, two of which form a characteristic series, while the others are sharply differentiated from their eastern relatives. The most striking feature of these species is the great elongation of the proboscis and the reduction of the labellae. The *leucophaea* series is separated, in addition, by the abdominal markings and comes nearer to certain Chilean species than any of the other Australian species. Three species are represented in other parts of Australia, *T. costalis costalis* Westw. being replaced in the west by a well marked subspecies which is almost worthy of separate specific rank, while *T. ruficosta*, nov., and *T. grisea*, nov., are

specifically distinct from, but clearly related to, the eastern *T. confusa*, nov., and *T. primitiva* Walk. If one excludes *T. fulva* Walk., the distribution of which is somewhat anomalous, the evidence points to a prolonged isolation from the eastern species in an area which has been considered to represent ancient Australia. There is no evidence, however, that the Western Australian *Trichophthalmas* are archaic; on the contrary, those that show affinities with the eastern species are more highly specialized than their eastern relatives in the length of the proboscis and in wing and body markings. The indications are that they are derived from the eastern species and not the reverse, and that they form an earlier and longer separated element of the radial dispersal from New South Wales.

The conclusions expressed above are open to the serious objection that the different areas have been studied to very different extents, eastern New South Wales being especially well collected, and it may be suggested that the differences met with may well be explained on these grounds alone. I have had this possibility clearly in mind throughout this study and have endeavoured to check my conclusions by reference to separated localities which have been fairly well collected, Brisbane for example, and I am convinced that there is a good deal more in the differences met with than can be explained in this way, although I fully expect new records and species to turn up, not only in the other States, but in New South Wales also.

There is no indication at present as to the mode of origin of the groups and subgroups, but within the series there is considerable evidence of the part played by isolation in the evolution of the species. There are three sets of cases indicating separation for varying lengths of time. There is in the first place the simple effect of long distance separation without any barrier. The modifications at the extreme ends of a continuous distribution would be slow in development, because of the slight amount of mingling that would inevitably occur. The endemic South Australian species are the best instances of this type and the *leucophaea* series is probably in part the result of the same process, but of longer duration. Another factor, however, enters here, namely, the development of a barrier which has probably completely isolated the Swanland species and which has consequently allowed them to differentiate from the eastern forms more rapidly than when they were in actual contact. Some such additional factor is necessary in order to account for the unique character of the fauna of Swanland. This barrier is the desert, the country along the Great Australian Bight having become progressively more arid since the close of the Pleistocene. There is no evidence that any of the Australian species are adapted to even moderately arid conditions. There is, however, a good deal of evidence that during the Pleistocene this area was well watered and was probably well suited for the development of Nemestrinids, and the western species may have reached their present home then (or possibly earlier, but there is no indication of what the climate was like earlier than the Pleistocene). Another post-Pleistocene barrier which has led to an interesting development is the separation of Tasmania from the mainland. All, or nearly all, of the *Trichophthalmas* must have been driven out of Tasmania during the Pleistocene, when the temperature was some ten degrees, F., lower than at present and the climate fairly inhospitable. *T. punctata* Macq. either survived in Tasmania or invaded it just before its final separation and there developed into the particular subspecies found there. This form has reinvaded the mainland, but none of the mainland species have reached

Tasmania since the Pleistocene. The explanation of this is found in a study of the wind-rose for Melbourne, when it is seen that the prevailing winds during the months when the *Trichophthalmas* are on the wing are from the south, an interesting correlation of distribution with meteorological conditions.

The third type of isolation is more recent and less complete than those described above. It consists in the splitting of a species into sections separated on different mountain tops, or part on the coast and part on the mountains, the greater environmental differences in the latter case producing a more marked effect. In the first instance the differences found, though apparent enough when dealing with long series of specimens, are not sufficient to warrant even subspecific distinction; *T. rufonigra*, nov., is a good example of this type, the coloration of the abdomen in the males, and of the wings in both sexes, differing noticeably between specimens from Kosciusko and those from Barrington Tops. The two subspecies of *T. bivitta* illustrate the second type.

It will be observed that the evidence presented above indicates that many of the species are not earlier than the Pleistocene in age, and this conclusion is supported by the systematic studies, there being every indication that the species are still in a state of flux and have not reached the stable condition seen in many other groups. The genus is an old one, and the groups and subgroups are well stabilized, but the species have apparently been undergoing marked changes and development in fairly recent times, possibly owing to the stimulating climate of the southern half of eastern Australia during and immediately after the Pleistocene.

One other question remains to be considered. In many animals distributed along the east coast of Australia, northern specimens differ markedly from the southern, and the same holds good for *T. nigripes* Macq., the differences found being dealt with fully under the description of that species. There are indications that further material will reveal a similar state of affairs in some other species.

While the effect of isolation has been stressed above, this is by no means the only factor involved in the evolution of the species, but it is the only one of which evidence can be produced at present. It is limited to the instances and conditions described and can hardly be made to apply, for example, to the bulk of the New South Wales species. The other factor or factors are, however, quite unknown.

The differences in seasonal occurrence, as well as distribution, between the *rosea* and the *costalis* groups have been mentioned above. There is a certain amount of information available as to the seasonal limits of the different species, which it is worth while summarizing here. Most of our data comes from the New South Wales species and especially, in the case of the *rosea* group, from those species occurring at the Royal Zoological Society's Biological Station at National Park, where a particular study of this question was made. The season in New South Wales may be divided into two parts with a definite gap between, the month of October being practically a blank as far as *Trichophthalmas* are concerned. August and September on the coast are entirely taken up by the *rosea* group, none of the other species appearing at this time. Each species has a season of about four or five weeks, the period of maximum prevalence being much shorter. The species appear and reach their maximum in a definite order. Thus, while three or four species may be taken together at almost any time in these months, the relative numbers of the species taken at different times vary markedly; for example, in the middle of August one sees a great number

of *T. rosea* Macq., many *T. primitiva* Walk. and a few *T. eques* Schin. and *T. albimacula* Walk.; in the latter part of September, on the other hand, *T. rosea* Macq. and *T. primitiva* Walk. are only represented by occasional ragged stragglers, while *T. eques* Schin. is commoner and *T. albimacula* occurs in fair numbers together with *T. ricardoae* Licht., which was not seen earlier. The order of appearance is: *T. primitiva* Walk., *T. rosea* Macq., *T. albimacula* Walk., *T. eques* Schin., *T. ricardoae* Licht., with *T. laetilinea* Walk. last, according to the records of this species which I have not taken myself. The season of this group at National Park coincides with that of *Epacris microphylla*, their favourite food plant in that locality. This is, however, not their only control, for at Woy Woy they feed on *Leptospermum* sp. and disappear long before the flowers are done. The climatic factor is probably the final control in this group.

The *costalis* and *novae-hollandiae* subgroups are on the wing in coastal areas from the end of October to the end of January. There is much less information as to succession of species, but the order seems to be—*punctata* series, *costalis* series, *novae-hollandiae* series, with a certain amount of overlapping. In Queensland, members of the *novae-hollandiae* subgroup have a much more extended season, the range being from October to April. It must be remembered that this subgroup has perhaps its greatest development in South Queensland and that it is the most adaptable of all the Trichophthalmas to different climatic conditions. For most species, however, the indications are that the time of appearance in Queensland is rather earlier than in New South Wales. On the mountains the season is distinctly later than on the coast, great numbers of Trichophthalmas being on the wing in February. A succession of species may also be found for the mountain forms, but the evidence is not yet sufficient to draw any definite conclusions.

Habits.

These flies are usually captured feeding at flowers. They are very selective, only one or two species of plant being attractive in any one locality. On the Hawkesbury Sandstone heath in early spring, when there is an abundance of flowering shrubs, practically the only one frequented is *Epacris microphylla*. Grass-trees (*Xanthorrhoea* sp.), *Leucopogon* sp. and *Sprengelia* sp. are occasionally visited for very short times. *Crowea saligna* was in one locality very attractive to *T. eques* Schin. In other types of country, such as the low Pleistocene sand-flats at Woy Woy, *Leptospermum* grows thickly and is very attractive. Members of this genus are also the most attractive plants on the mountains later in the season. On the coast in the middle of summer *Kunzia*, *Angophora* and *Eucalyptus* flowers are the ones visited, but they never attract such numbers as does *Epacris microphylla* or the Leptospermums. When feeding, the insect grasps the flower, or the stem just below it, with its legs and keeps its wings vibrating rapidly, but not so rapidly as when in flight, the note produced dropping markedly in pitch each time the fly touches a flower. This is particularly well illustrated in Pl. 1, Fig. 4. I have never seen Trichophthalmas actually hovering while feeding, the plant in all cases being grasped by the legs. It is very rare, however, to see the wings come to rest. The fly stays two or three seconds at each flower and then quickly flies to another, twenty to thirty flowers being visited in a minute. The feeding may be kept up for several minutes and almost all the attractive flowers in a patch visited before the insect leaves it. They are very easily disturbed by any sudden movement and disappear in a

flash. This description of the feeding habits indicates the great difficulties encountered by Mr. Nicholson in photographing these insects alive and the patience and dexterity necessary in order to get an exposure.

Males are frequently seen playing and hovering in the air when not feeding, but one rarely takes a female at such times. Their loud, high-pitched, characteristic note usually attracts attention to them before they are seen. Their circling and twisting movements, indulged in at irregular intervals whether disturbed or not, are dazzling in their swiftness and their capture would be extremely difficult were it not for the fact that they almost invariably return immediately to the spot where they had previously been hovering. When feeding on flowers, however, if disturbed they disappear in a flash and never return. This hovering habit is not uncommon in other Diptera, but reaches its highest development in the *Trichophthalmas*.

These habits are approached by *Trichopsidea oestracea* Westw., but are in marked contrast with those of *Exeretoneura maculipennis* Macq., as was well seen at Barrington Tops, where both *Trichophthalma* and *Exeretoneura* were abundant, the latter being a lethargic, slow-moving type and not feeding on the flowers.

Nothing is known of the life history of any of the Australian Nemestrinids. Attempts to find the larvae in situations where the adults are abundant have all failed, numerous Asilid and Therevid larvae being turned up, but nothing that could be assigned to the Nemestrinidae. There is little indication from the habits of the adults as to what to look for, but White's (1914) record of the habit of the female *T. punctata* Macq. of resting on the young wattles may possibly have a bearing on their egg-laying habits. We have seen females of *T. costalis* Westw. in a sandy locality resting on bracken or hovering and flying about close to the ground, but they did not give any other indication of possibly being about to oviposit. Studies of seasonal distribution strongly indicate that there is not more than one brood each season, no species being known to appear twice in one year. Several females of *T. rosea* Macq. were brought to the laboratory alive and in one case eggs were laid, but to date (two months later) have not hatched. They were scattered in little irregular masses all over the lower part of the sides of the jar and on the sand at the bottom. The contrast with the neat egg-masses of Tabanids ovipositing under similar conditions is very marked; this, however, may not be the natural method. The egg (Text-fig. 8, p. 500) is pale creamy-white in colour, without any sculpturing or marking, torpedo-shaped and distinctly more bluntly rounded at one end than the other. The eggs appear to be sticky and adhere to one another, to the sand, and to the sides of the vessel. An average egg is 1.30 mm. long by 0.22 mm. wide.

Systematics.

The different groups and subgroups are easily recognized, but it is much more difficult to recognize some of the closely related species, especially in the *punctata* series of the *costalis* subgroup. While the primary subdivision is on antennal characters, there are sufficient differences in other respects to make the position of an insect clear even when the antennae are missing, and these are given in brackets in the following key, which (except for the genitalia, which are dealt with fully on p. 499) serves also as a definition of the groups and subgroups. It is interesting to note that species from different groups or subgroups may resemble one another strongly in general appearance, for example,



T. intermedia, nov. and *T. bancrofti*, nov., *T. rufonigra*, nov. and *T. novae-hollandiae* Macq., while *T. nigrovittata*, nov. and *T. leucophaea* Walk. have a superficial resemblance to species of the *rosea* group. The *costalis* subgroup is fairly uniform, but I have divided it into three series, partly for convenience and partly to indicate the relationships of the species. There are no very marked characters separating these series and a linking form is seen in *T. intermedia*, nov., which has been placed provisionally in the *costalis* series. The *novae-hollandiae* subgroup is very uniform, as is also the *rosea* group, with the exception of *T. lactilinea* Walk. and *T. ricardoae* Licht., which form a series apart from the rest and show interesting characters linking them with the *costalis* group. My *costalis* subgroup corresponds with Hardy's Group 1, the *novae-hollandiae* subgroup with his Group 2, and the *rosea* group with his Groups 4, 5 and 6. Groups 4 and 5 of Hardy may be reasonably separated as series, but Group 6 (*T. primitiva* Walk.) should go in with the species of Group 4, to which it is closely related in all bodily characters.

Key to groups and subgroups.

- A. Third antennal segment conical, never divided by a sulcus near its base. (Palpi always obvious, never obscured by hair; wing with M_{3+4} continuous, or nearly so, with rest of oblique vein.) *costalis* group.
 - a. Palpi slender, second segment short, acuminate, apical pit small *costalis* subgroup.
 - b. Palpi stout, second segment as long as first and stouter than it, apical pit large and obvious *novae-hollandiae* subgroup.
- B. Third antennal segment long, cylindrical, with well-marked sulcus near its base. (Palpi greatly obscured by hair and vein M_{3+4} markedly displaced towards wing-root, or abdomen with shining pale transverse markings or spots) *rosea* group.

Key to species of the costalis subgroup.

1. Brown or greyish nearly concolorous species, abdominal markings irregular if contrasted, palpi moderately slender (*costalis* series) 3

Fulvous species, with strong contrast between markings and ground colour of abdomen, palpi very slender 2
2. Proboscis more than three times the head length, labellae small and inconspicuous (*leucophaea* series) 12

Proboscis at most twice the head length, labellae at least moderately prominent (*punctata* series) 13
3. Abdomen without transversely disposed spots, at most with longitudinal darker blotch 4

Abdominal segments with transversely disposed darker spots, on some segments linked by a basal dark band 11
4. Thorax grey, abdomen yellowish with irregular median grey stripe .. *intermedia*, nov.

Thorax and abdomen dark brown 5
5. Males 6

Females 9
6. Abdomen with prominent basal band of white hairs 7

No such band 8
7. Apical third of wing clear white, Western Australia *costalis apicalis*.

Brown coloration of wing fading gradually to apex, East Australia *costalis costalis* Westw.
8. Very large dark species with grey pleurae. Eastern Highlands *rufonigra*, nov.

Medium sized species, reddish-brown in colour, pleurae white, South Australia .. *subcostalis*, nov.
9. Proboscis more than twice the head length, labellae inconspicuous, Western Australia *costalis apicalis*, nov.

Proboscis less than twice the head length, labellae conspicuous, Eastern Australia .. 10
10. Large dark species with grey pleurae *rufonigra*, nov.

Medium-sized dull brown species, pleural hairs white *costalis costalis* Westw.

11. Very small reddish-brown species, proboscis long, ninth tergite of male as in Text-fig. 6, *j* *fuscata*, nov.
Medium-sized greyish-brown species, proboscis short, ninth tergite not unusual *obscura* Westw.
12. All abdominal stripes about equal in breadth *leucophaea* Walk.
Brown side margins and black median stripe very narrow relative to the grey intermediate areas *longirostris*, nov.
13. Abdomen with narrow median black stripe or row of small spots, side margins and posterior edges of segments never with any dark markings 14
Abdomen with dark median stripe, side margins always, and apical edges of segments often, with dark markings 15
14. Thorax brown with two indistinct paler stripes, abdomen orange to drab with small median black spots *punctata* Macq.
Thorax dark brown with two prominent paler stripes, abdomen bright orange with black band *fulva* Walk.
15. Thorax dark brown or black, with two or three narrow yellow or grey lines, male genitalia as in Text-fig. 6, *g* 16
Thorax velvety-black with gold hairs especially at the sides, genitalia various ... 19
Thorax dark grey, unmarked, abdomen with dark median and sublateral stripes *ruficosta*, nov.
Thorax brown, pale longitudinal stripes equal in width to the dark median part, abdomen with dark median and lateral stripes, genitalia as in Text-fig. 6, *d* *confusa*, nov.
16. Sides of scutum with pale zone small and very obscure 17
Pale zone at sides of scutum forming a prominent broad band extending above wing root 18
17. Scutum with three very narrow yellow lines *trilinealis*, nov.
Scutum with two broader greyish lines *griseolineata*, nov.
18. Abdomen pale fawn, with broad black median stripe and prominent black side margins *nicholsoni*, nov.
Abdomen yellowish-brown, with narrow median stripe and inconspicuous black markings at sides *dubiosa*, nov.
19. Male genitalia as in Text-fig. 6, *e* 20
Male genitalia as in Text-fig. 6, *f* *harrisoni*, nov.
20. Costa pale brown, very small species *bivitta bivitta* Walk.
Costa very dark brown, small medium species *bivitta nigricosta*, nov.

Note.—It has been very difficult to construct a satisfactory key to this subgroup and determinations made by means of it should always be checked by a reference to the original description. *T. intermedia*, nov., and some Tasmanian specimens of *T. punctata* Macq. may be placed in their wrong series to begin with, but they will not then run down to any of the species. In both, the palpi are a help and in the latter the single row of clear-cut black abdominal spots is quite characteristic, even though the ground colour may be fairly dark. My *T. confusa* is the *T. fulva* Walk. of many workers and is the common coastal species of this series in New South Wales. *T. ales* Newm. is omitted.

Key to species of the novae-hollandiae subgroup.

1. Abdomen orange with broad black median stripe and black side margins *nigrovittata*, nov.
Abdomen not as above 2
2. Sides of thorax and abdomen with bright mustard-yellow hairs; ninth tergite of male as in Text-fig. 6, *k* *nigripes* Macq.
Lateral hairs at most dull yellow; ninth tergite of male as in Text-fig. 4, *d* 3
3. Rich to dark brown concolorous species *novae-hollandiae* Macq.
Thorax grey, abdomen yellowish with irregular grey median stripe .. *bancrofti*, nov.

Key to species of rosea group.

1. Palpi greatly obscured by hair, vein M_{2+4} considerably displaced, abdomen without bright transverse markings (*rosea* series) 2

- Palpi easily seen, vein M_{3+4} not so markedly displaced, abdomen with bright transverse markings (*laetilinea* series) 7
2. Abdomen with well-defined pale stripes or spots 3
3. Abdomen dull grey with inconspicuous darker markings 6
3. Thorax dark brown with two narrow grey lines *albimacula* Walk.
Thorax grey with broad black median stripes and less marked black lateral stripes .. 4
4. Abdomen black with yellow spots *variolosa* Licht.*
Abdomen black with two broad grey stripes 5
5. Foxy-red line at side of thorax and terminal abdominal segments in both sexes,
in male all under surface rose-pink *rosea* Macq.
No red or rosy colour, margins and under surface pale yellow to greyish-white
in both sexes *eques* Schin.
6. Abdomen with dark transverse bands *primitiva* Walk.
Abdomen with dark median round spots *grisea*, nov.
7. Large species, abdomen with golden transverse bands, bulb of aedeagus rounded
..... *laetilinea* Walk.
Small species, abdomen with paler transverse bands or spots, bulb of aedeagus
bilobed *ricardoae* Licht.

* I have not seen this species.

Descriptions of species.

A.—*costalis* subgroup.

TRICHOPTHALMA COSTALIS COSTALIS Westwood.

Nemestrina (*Trichophthalma*) *costalis* Westwood, 1835.—? *Rhynchocephalus ales* Newman, 1841.—*Trichophthalma albibasis* Walker, 1857.—*Hirnoneura Heydenii* Jaennicke, 1867.—*Trichophthalma fuscipennis* Thomson, 1869.—*T. ochropa* Thomson, 1869.—*T. costalis* Westw. of authors.

Westwood, 1835, p. 448; 1838, p. 86.—Newman, 1841, p. 220.—Walker, 1857, p. 134.—Jaennicke, 1867, p. 336, Pl. 43, fig. 7.—Schiner, 1868, p. 112.—Thomson, 1869, p. 447.—Lichtwardt, 1910a, pp. 372, 375, 381, 384, 385.—Hardy, 1924, pp. 451, 452, 453.

"Thorace fusco; capituli facie alba; oculis piceo-pubescentibus; abdomine rufescenti-fusco; basin et apicem versus corporeque toto subtus pubescentia albocinerascenti indutis; pedibus rufescentibus; antennarum articulis terminalibus nigris; alis elongatis; costa late fuscanti; proboscide nigro; capite paullo longiori. Long. corp. (probosc. excl.) lin. 7. Exp. alar. lin. 17.

"Habitat in Nova Hollandia. In mus. nostr. Communicavit Dom. Shuckard."

I have divided this species into two, separating the Western Australian form as a distinct subspecies.

Medium-sized, fairly stout-bodied, dark reddish-brown species; wings smoky with anterior half dark brown; legs brown; abdomen of male with characteristic transverse basal band of dense whitish-grey hairs.

♂. Eyes dark reddish-brown, not quite meeting at apex of facial triangle, hairs dark brown above, almost white below; frons grey, sometimes almost white, with fine white hairs, keel well marked, partly brown; face projecting below antennae, sides of oral margin pale brown, underface with dense long shaggy white beard, yellowish in front. Antennae with first segment pale yellowish-brown with white hairs, second segment brown with black hairs, third segment and style black. Proboscis a little longer than the head, fairly stout and with prominent labellae; palpi (Text-fig. 2, c) with basal segment dark brown, apical segment bright brown, thin; apical pit easily seen, whole palp covered with sparse short black hairs.

Thorax uniform dark reddish-brown, except for a pale spot on each side at medial end of the transverse suture, which is incomplete. Dorsum clothed

with short rather sparse brown hairs; hairs at side margins long and dense and mostly brown to grey in colour; an especially long tuft of hairs behind the wing root; scutellum dark reddish-brown, edged with long shaggy pale grey hairs. Pleurae white with long white hairs mixed with grey. Legs reddish-brown, knees pale, dorsal aspect of tibiae darker brown, tarsi darker, hind tibiae and tarsi darker brown. Wings long, rather narrow apically, somewhat smoky throughout, with the fore-border brown to apex of cell Sc, the colour extending a little behind R_{2+3} in the middle of the wing.

Abdomen short, broad, rather abruptly conical, dark reddish-brown with slightly paler side and hind margins to the segments and a darker centre, which is sometimes fairly apparent. Sides with dense pale grey hairs intermixed with a variable amount of brown; first segment and base of second with dense long shaggy greyish-white hairs forming a striking pale transverse band. Venter pale grey with short silky whitish hairs. Genitalia as in Text-fig. 4, *a, b, c*.

♀. Eyes separated by nearly the width of the ocellar triangle; keel on face not prominent, beard pure white; palpi more acuminate apically than in the male. Thorax and abdomen dull brown with no reddish tinge; hair tufts at sides of thorax, on scutellum and behind wing roots darker and less striking than in the male. Pale hairs at base of the abdomen not forming a striking band, sometimes hardly distinguishable, rest of abdomen with sparse short stout hairs only. Pleurae and venter with pure white hairs.

Length: ♂, body 14 mm., wing 15 mm.; ♀, with ovipositor extended, 15 mm. There are two very small males before me, which measure 11 and 9.5 mm., also a large male from Mt. Tambourine, Queensland, which is 16 mm. long; otherwise the size both of males and females is close to the average.

This subspecies is easily recognized in the male by the white base to the abdomen and by the way the brown colour gradually fades towards the apex of the wing. The separation of the related females is dealt with under *T. rufonigra*, nov.

The above description is based on a series of 27 males and 10 females from a considerable number of localities in the Eastern States. This subspecies is most abundant in the coastal districts and on the mountains of New South Wales and South Queensland, the most northern record being a male from Wide Bay, Queensland. There are also two males in the National Museum from Victoria, the localities being Oakleigh and Wilson's Promontory, and another in the Macleay Museum labelled South Australia without any further data. I have seen no specimens of the typical subspecies from Western Australia. In New South Wales individuals may frequently be seen, but never in great numbers. Their season is from the end of October to the end of December in coastal districts, rather later in the mountains. On coastal Queensland the season appears to be earlier. They have been taken feeding on *Leptospermum* and flowering Eucalypts, the males sometimes being seen hovering under trees. At Broken Bay, N.S.W., in December, this subspecies was feeding on the flowers of a Eucalypt about twenty feet in the air; the males spent a good deal of time hovering perfectly motionless in the air ten or twelve feet from the ground, but occasionally near enough to be captured. When the females had finished feeding, they came right to the ground and rested on the bracken or flew about over the sand.

With regard to the synonymy noted above, it is easy to determine all except *T. ales* Newm. *T. Heydenii* Jaenn. is admirably described and fits the male of this subspecies completely. Lichtwardt considers it to be a synonym of *T.*

punctata Macq., basing his conclusions on a male (which was apparently not the type) in the Stockholm Museum, but the description does not fit *T. punctata* Macq. and I believe his conclusion to be incorrect. Hardy records *Heydenii* Jaenn. from Western Australia and identified a pair in the Australian Museum as this species; this is a misidentification due to Hardy having mistaken Jaennicke's fig. 6 of *H. nemestrinoides* Jaenn. from Chili for that of *Heydenii* which was illustrated in fig. 7. The Chilian species bears an extraordinary resemblance to the pair in the Australian Museum. *T. ochropa* Thom. is difficult to place. Thomson says it is like *quadricolor* Walk. (= *punctata* Macq.) and, when describing *T. fuscipennis* Thom., which is an undoubted synonym of *costalis* Westw., he says it may be the male of *ochropa* Thom. Lichtwardt considers that *ochropa* Thom. is probably the female of *albibasis* Walk. (= *costalis* Westw.) and the description fits this species reasonably well. Hardy places it as a synonym of *T. fulva* Walk., but the description cannot be made to apply to any member of the *punctata* series.

Newman's description of his *Rhynchocephalus ales* is as follows:

"Instrumenta cibaria desunt: corpus breve postice acuminatum, lanuginosum, supra fuscum, subtus canum: alae longiores et (pleurumque basin versus) angustiores, fusco tinctae, regione costali satuatori: pedes testacei. (Corp. long. .6 unc., alar. lat. 2 unc.).

"Inhabits New Holland. A single specimen is in Mr. Shuckard's cabinet."

This description is quite inadequate; the species may be *costalis* Westw., as Hardy suggests, or the name must be eliminated as a *nomen nudum*, unless the type be discovered and redescribed.

TRICHOPTHALMA COSTALIS APICALIS, n. subsp.

♂. Readily recognized by the coloration of the wing, the brown and general smokiness ending abruptly, leaving the apical third clear white. It also differs from the typical subspecies in its larger size and in the proboscis, which is longer and slenderer, ending in small relatively inconspicuous labellae. The palpi are stouter and the apical pit wider. The band of shaggy hairs at the base of the abdomen is more grey in colour. Genitalia similar.

♀. Two females in Dr. Ferguson's collection are provisionally allotted to this subspecies, as no males of either the typical subspecies or of *T. rufonigra*, nov., have been found in Western Australia. The wing does not show the clear apical third seen in the male, but the size, proboscis and palpi are similar. In other respects it closely resembles the female of the typical subspecies.

Length: ♂, body 17 mm., wing 18 mm.; ♀, 18 mm. long.

While this form is easily separable, at any rate on the male, from the typical subspecies, it is obviously closely related and its true position is, in my opinion, more accurately defined by making it a subspecies, rather than by giving it separate specific rank, an arrangement which brings the distributional differences into due prominence.

Distribution.—Western Australia: 2 ♂♂ from Perth, 15th November, 1924, coll. Nicholson; 2 ♂♂, King George's Sound, no date, in the Australian Museum; 1 ♂ from Hamel, no date, in the Queensland Museum; 2 ♀♀, Mundaring, no date, in coll. Ferguson.

Holotype, a ♂ from Perth, 15th November, 1924, and allotype, a ♀ from Mundaring, both in the Macleay Museum. Paratypes in collections named above.

TRICHOPHTHALMA RUFONIGRA, n. sp.

A large, stout, dark brown species; wings smoky with brown fore-border; legs rich reddish-brown; abdomen of male with reddish tinge, no band of white pubescence.

♂. Eyes brownish-black, not quite meeting below ocelli, hairs brown above, paler towards lower margin. Frons yellowish-grey, keel not prominent, but with a long vertical median incision which is brown and spreads into a brown patch between the antennae; face projecting slightly, oral margin brown, underface grey with dark brown almost black beard. Antennae like *T. costalis costalis* Westw. Proboscis slightly longer than the head, stout, labellae prominent; palpi with second segment clearly marked off, apical pit larger than usual, with a small projection on the dorsomedial aspect of its edge.

Thorax dark brown, with a pale patch at the medial end of the transverse suture, covered dorsally with sparse short black hairs. Side margins with dense brown hairs, postalar tuft brown, scutellum reddish-brown with dark brown marginal hairs. Pleurae brownish-grey with brown hairs. Wings long, somewhat smoky, fore-margin broadly dark brown. Legs rich reddish-brown, darker than in *T. costalis* Westw., distal tarsals almost black; hind tibia and tarsus much darker.

Abdomen slightly longer than broad, dark reddish-brown with almost black side-margins and broad median band. Base of second segment with a narrow zone of paler hairs, rest of abdomen with sparse fairly long black hairs; sides with dense black hairs. Venter greyish-brown with brown hairs. Genitalia as in *T. costalis* Westw.

♀. Eyes separated by width of ocellar triangle, beard pale brownish-grey. Thorax and abdomen a duller brown than in male, hair at side margins much scantier and of a more greyish tint. Pleurae and venter grey with paler greyish-brown hairs than in the male. Legs and wings as in male.

In the Kosciusko specimens the beard, pleurae and venter are much paler than in the typical form from Barrington Tops, and the reddish coloration of the abdomen of the male is much more prominent. This is very suggestive of an early stage in the development of subspecies by isolation on two separated mountain tops. This species is readily distinguished on the male from *T. costalis* Westw. by the absence of the white basal band to the abdomen. Both sexes can be immediately separated from *T. novae-hollandiae* Macq., to which this species bears a strong superficial resemblance, on the palpal characters.

Length: ♂, body 19 mm., wing 20 mm.; ♀, body 21 mm. The smallest specimen before me is a ♀ from Hartley and is 18 mm. long, which is considerably larger than the largest specimen of *T. costalis costalis* Westw.

Distribution.—New South Wales: Barrington Tops, early February, 1925, 12 ♂♂ and 19 ♀♀, feeding on *Leptospermum* flowers; Kosciusko, 11th February, 1924, 5 ♂♂ and 7 ♀♀, some feeding on *Leptospermum*, coll. Nicholson; Hartley, 29th December, 1923, 1 ♀, on *Leptospermum*; Mittagong, 30th November, 1924, Goldfinch, 1 female in Coll. Ferguson; Ulong, E. Dorrigo, 1st February, 1919, Heron, 1 ♀ in the Australian Museum. This species is apparently restricted to high altitudes and appears usually towards the end of the season. At Barrington Tops, it and *T. novae-hollandiae* Macq., which it closely resembles superficially, were very abundant, flying and feeding actively during any spells of sunshine.

Holotype ♂ and allotype ♀ from Barrington Tops, early February, in the Macleay Museum.

While the males of *T. costalis costalis* Westw., *T. costalis apicalis*, nov., and *T. rufonigra*, nov., are easily separable, the females are closely similar, but may be distinguished by a comparison of the following points:

(a) *T. costalis apicalis*, nov., closely resembles the typical subspecies in coloration, etc., but may be separated by the long slender proboscis and small labellae; it is also slightly larger and has a different distribution.

(b) *T. costalis costalis* Westw. has a short stout proboscis with prominent labellae, is a medium-sized species, has a pure white beard, pleurae and venter with white hairs, and has the apical pit of the palp small.

(c) *T. rufonigra*, nov., also has a short stout proboscis with prominent labellae, but is recognized by its much larger size, darker colour, wider palpal pit, and by its beard and pleurae which are always more grey or brown than white, even in the pale Kosciusko specimens.

TRICHOPHTHALMA SUBCOSTALIS, n. sp.

A median sized species with dull brown thorax and reddish-brown abdomen without dense basal white hairs. Wings smoky, with costal margin faintly suffused with brown. Legs yellowish-brown.

♂. Eyes brownish-black, close together below ocelli but more separated than in either *T. costalis* Westw. or *T. rufonigra*, nov., hairs brown above, pale below. Frons pale yellow, no keel but a slight incision in the mid-line; face pale yellow, oral margin yellowish-brown with sparse brown hairs; beard yellowish-white. Antennae like *T. costalis costalis* Westw., but second segment with pale hairs and third segment and style dark brown rather than blackish. Proboscis rather longer than head, moderately stout, labellae rather small but better developed than in *T. costalis apicalis*, nov.; palpi light brown with apex pitchy, otherwise like *T. costalis costalis* Westw.

Thorax dull brown with black hairs (parts of the thorax of this specimen are irregularly black, apparently due to greasiness). Side margins with fairly dense yellowish-grey hairs; postalar tuft long, of same colour; scutellum brown with yellow and brownish marginal hairs. Pleurae pale grey with white hairs. Wings somewhat smoky, slightly suffused with brown along the anterior margin. Legs yellowish-brown, tarsi darker, hind tibia and tarsus darker brown.

Abdomen longer in proportion to its breadth than in the species described above, reddish-brown in colour, with an irregular median black band; covered with sparse brown hairs, somewhat longer and paler at the base; side margins with fairly dense brownish-yellow hairs. Venter ochreous, with yellow hairs. Genitalia as in *T. costalis* Westw., but distostyle more acuminate apically.

Length: ♂, body 14 mm., wing 14 mm.

Holotype, the unique male from Tulka, Proper Bay, Eyre's Peninsula, South Australia, no date, E. Troughton, in the Australian Museum.

Recognized from *T. costalis* Westw. by the absence of the basal white band to the abdomen, and from *T. rufonigra*, nov., by its smaller size, pale beard and white pleurae, paler wing coloration, and by its paler coloured more acuminate palpi. I am at a loss to suggest any way by which the female may be recognized when found, and there is an element of doubt in my mind as to the validity of this species. It may prove to be a subspecies of *T. rufonigra*, nov., when more is known about it and its distribution.

TRICHOPTHALMA OBSCURA Westwood.

Nemestrina (Trichophthalma) obscura Westwood.

Westwood, 1835, p. 448; 1838, p. 86.—Hardy, 1924, p. 451.

"Obscure cinerea; pedibus rufescentibus; facie alba; proboscide capite fere duplo longiori; alis ad costam tenuiter fuscantibus; ocello antico aliis remoto. Long. corp. (probosc. excl.) lin. 5½. Exp. alar. lin. 14.

"Habitat in Africa?—In mus. D. Hope."

A medium-sized brown to greyish species. Anterior border of wing suffused with brown. Abdomen brown to greyish-brown, with definite dark brown markings. Pleurae with pure white hairs. Legs brown to greyish-brown.

♂. Eyes reddish to dark brown, almost meeting below ocelli, hairs dark brown above, pale yellowish round lower border. Frons yellow with brown keel, epistoma brown in dark specimens; frons, keel and epistoma pure white in the paler broader specimens; beard pure white, anterior part varying from a tinge of yellow to dark brown. Antennae pitchy, basal segments with a variable amount of pale hoariness, pure white in some specimens. Proboscis a little longer than the head, stout, with prominent labellae; palpi brown with dark tip, varying to entirely pitchy-black.

Thorax brown to dark brown, with dark hairs. Side margins with dark grey mixed with paler hairs; postalar tuft similar; scutellum with dark hairs above, pale brown below hind margin. Pleurae pale grey with silky white hairs, intermixed with some grey ones in some specimens. Wings somewhat smoky, brown along fore-border which is very dark in the slender specimens. Legs in dark specimens bright brown, dorsal aspects of tibiae and tarsi darker, hind tibia and tarsus dark brown, almost black on distal tarsals; in the paler specimens the legs are a pale greyish-brown.

Abdomen very variable in length, brown to greyish-brown in colour, with definite darker markings which take the form of three large transversely disposed spots on each segment; these spots are joined on the second and sometimes on the subsequent segments by a broad transverse basal dark band; the spots are somewhat variable in extent in different specimens, but are always easily seen and are a useful character. Hairs on abdomen dark brown, with a more or less evident transverse zone of pale hairs at the base of the second segment, never, however, resembling the condition seen in *T. costalis* Westw.; side margins with dark brown hairs with small patches of paler ones. Venter greyish-white with pure white silky hairs. Genitalia not unlike *T. costalis* Westw.

♀. As is usual, the lateral thoracic and abdominal hairs are less developed, otherwise this sex resembles the male in essential respects.

The extremes are represented, on the one hand by a pair from Barrington Tops, which are of slender form and dark colour, on the other by two males from the Dorrigo which are of short stout habit, pale colour, and also differ slightly in the genitalia, the middle part of the distal end of the ninth tergite being slightly incised instead of rounded. This appearance is due more, however, to a slight bending of the apical part than to an actual difference in outline. These two sets of specimens would be placed in distinct species were it not for the intermediates which we possess. The genitalic difference is very slight and not to be relied on without further data.

Length: Body 13 mm., wing 13 mm. This applies to all types. The width of the abdomen in the slender male is 5 mm. and in the stout one 6.4 mm., which sufficiently indicates the difference in form.

Distribution.—Queensland: Mt. Tambourine. New South Wales: Dorrigo (Ulong and Meldrum), Barrington Tops, Kendall, Terrigal. The dates of the highland specimens are early February, of the Terrigal specimen, January.

This species is recognized by the absence of a white band on the male abdomen, by the slender habit of the dark forms and the greyish-brown colour of the stout specimens, and especially by the definite markings of a darker colour on the abdomen.

The propriety of allotting the name *obscura* Westw. to this species is somewhat doubtful. The original description is vague and the locality doubtful. White, however, identified a specimen in Dr. Ferguson's collection as *T. obscura* Westw. and, since he may have seen the type, his determination may be accepted for the present, otherwise the name cannot be placed. It seems fairly certain that it is not an African species. Hardy queries *obscura* Westw. as a synonym of *costalis* Westw., basing his conclusion on White's identification; the species may, however, be readily separated from *T. costalis costalis* Westw. on the male, and almost as readily on the female, when good specimens are available.

TRICHOPTHALMA FUSCA, n. sp.

A small brown species with abdominal spots. Proboscis long and with small labellae. Wings with fore-borders brown. Legs brown. Ninth tergite of male characteristic.

♂. Eyes dark brown, separated by the width of the anterior ocellus; hairs brown above, pale yellowish below. Frons and face yellowish-grey, in one specimen white; beard white. Antennae with basal segments light greyish-brown, third segment and style pitchy. Proboscis more than twice the length of the head, moderately slender, labellae small; palpi dark brown, second segment longer than usual in this group, but equally as slender.

Scutum and scutellum dark brown with dark brown hairs; side margins with mixed grey and creamy hairs; postalar tuft long and creamy; margin of scutellum with light brown hairs. Pleurae pale grey with creamy hairs (some specimens have the hair in front of the wing roots yellow, due, I think, to discoloration). Wings fairly clear, cells C, Sc and 1st R brown. Legs with basal half of femora yellowish, rest of legs rich brown, darker on tarsi.

Abdomen rather dark greyish-brown with large round median spots and lateral patches of the same colour. The abdominal hairs are long and are rather denser and paler basally than on the rest of the abdomen; side margins (somewhat rubbed in the type) with alternating patches of dark brown and creamy hairs. Venter pale grey with creamy hairs. Genitalia (Text-fig. 6, j) showing a marked difference in the shape of the distal end of the ninth tergite from the rest of the subgroup and resembling the condition found in the *novae-hollandiae* subgroup; males may be recognized even with a hand-lens by this character; the apical part of the distostyle is also somewhat differently shaped from the other species.

♀. Eye width equal to diameter of ocellar triangle and body not so hairy, otherwise exactly similar to male.

Length: ♂, body 10 mm., wing 10 mm. ♀ the same.

This species is readily recognized by its small size, abdominal spots, long proboscis, and ninth tergite of the male. Its nearest ally appears to be *T. obscura* Westw. which is much larger, has a short proboscis and different genitalia.

Distribution.—Queensland: Port Curtis, no date, 2 ♂♂ in the Macleay Museum; Gayndah, no date, a ♂ and ♀ in the Australian Museum. New South Wales: Pipers Flat, no date, a ♂ in the Macleay Museum.

Holotype ♂ and allotype ♀, both from Gayndah, in the Australian Museum. Paratypes, other specimens as above.

TRICHOPTHALMA INTERMEDIA, n. sp.

A large species of moderate stoutness. Thorax uniformly grey, abdomen brownish-yellow with an irregular median grey stripe. Legs brown, hind darker. Wings with fore border broadly brown. Superficially closely resembles *T. bancrofti*, nov.

♂, ♀. Eyes blackish-brown, almost meeting below ocelli in ♂, with dark brown hairs above, creamy below. Frons brown, covered with greyish-white bloom, bare, keel inconspicuous; face bright brown, with sparse short coarse black hairs; beard inconspicuous, creamy, brownish anteriorly. Basal segment of antenna brown, second black, both with coarse black hairs (a few yellow ones on basal segment in the female), third segment and style black. Proboscis a little longer than the head, stout and with prominent labellae; palpi dark brown, light brown on medial side of apical segment, with stout black hairs.

Scutum uniformly slate-grey, scutellum greyish-brown, both covered with sparse short black hairs. Sides of scutum with rather sparse black hairs mixed with some creamy ones; postalar tuft creamy; margin of scutellum with black hairs above, creamy below. Pleurae pale grey with tufts of creamy hairs. Legs bright brown, hind tibia and tarsus dark brown. Wings somewhat smoky, broadly brown basally, the colour extending to origin of R_{4+5} from the oblique vein and then fading rather abruptly; cells Sc and R_1 brown for their entire length.

Abdomen fairly broad, dull brownish-yellow, with an irregular median longitudinal slate-grey stripe. Dorsum covered with sparse coarse short black hairs; base of second segment with a transverse row of finer longer creamy hairs; side margins with mixed black and creamy hairs, which do not form the conspicuous fringe in the male usually seen in this sex. Venter greyish-white, with very sparse and fine silky white hairs. Genitalia not unlike *T. costalis* Westw., but the median lobe at the distal end of the ninth tergite is smaller and more pointed.

Length: ♂, body 18 mm., wing 17 mm.; ♀, with ovipositor extended, 21 mm.

Holotype ♂ from Russell Island, December, 1921; allotype ♀ from Stradbroke Island, 3rd December, 1912, both in the Queensland Museum.

This species bears a close superficial resemblance to *T. bancrofti*, nov., from which it is easily separated by the subgroup characters. In other respects it is somewhat intermediate between the *costalis* and the *punctata* series, but the relatively stout palpi and general dullness of the coloration indicate closer affinities with the former.

TRICHOPTHALMA PUNCTATA Macquart.

Hirnoneura punctata Macquart, 1846.—*H. nigriventris* Macquart, 1850.—*H. novae-hollandiae* Macquart, 1850 nec 1846.—*Trichophthalma novae-hollandiae* Macq., White, 1914.—*T. quadricolor* Walker, 1849.

Macquart, 1846, p. 101; 1850, p. 98, Pl. ix, fig. 9, and p. 99.—Walker, 1849, p. 234.—Lichtwardt, 1910a, pp. 376 and 380.—White, 1914, p. 65, fig. 9.—Hardy, 1924, p. 452.

"*Fusca cinereo-tomentosa*. Abdomine nigro punctata; lateribus rufis. Pedibus rufis.

"Long de 5, 6 ♂ l. Trompe menue, long de 1½ l., à lèvres assez épaisses. Palpes jaunes, à extrémité brune. Barbe blanche. Face fauve à léger duvet jaunâtre. Front à duvet blanc. Antennes noires; premier article brunâtre; troisième conique. Yeux velus. Thorax brun, à duvet grisâtre et poils fauves. Abdomen à duvet gris, côtés fauves et taches ou bandes dorsales noires; ventre et poitrine à duvet blanc. Cuisses à poils blancs. Ailes assez claires; base et bord extérieur bruns; nervures comme dans l'H. *Novae Hollandiae*. De la Tasmanie. Muséum."

A variable species both in size and colour, the size varying from large-medium stout to small slender specimens, and the colour of the abdomen from rich orange to dull drab in the male, female always dark and rather slender. Thorax with two indistinct paler longitudinal lines on a brown ground. Abdomen with a characteristic median line of small black spots. Wings with fore-borders brown. There are two subspecies and one variety.

♂. Eyes dark reddish-brown, almost meeting below ocelli, hairs brown above, creamy-white below. Frons greyish-yellow to yellowish-brown, with a line of fine creamy hairs on each side of an inconspicuous keel; face same colour, with sparse hairs, creamy in pale, black in dark specimens; beard short, creamy-white. Basal segments of antenna with creamy-yellow bloom and creamy hairs, third segment and style black. Proboscis one-half longer than the head, of moderate thickness and with prominent labellae; palpi brown, black at tip, with coarse short black hairs.

Thorax dull brown with an indistinct paler brown stripe on each side of the mid-line, these stripes becoming confluent in front of the scutellum which is the same colour as the stripes. Dorsum with rather long fine brown hairs; side margins with dense long creamy hairs mixed with some grey ones; postalar tuft similar; scutellum with almost entirely orange hairs at the edge. Pleurae pale grey with long silky creamy-white hairs. Legs yellowish-brown, dark brown dorsally on tarsi, hind tibia and tarsus dark brown, almost black dorsally on tarsi. Wings clear to somewhat smoky, brown along fore border.

Abdomen orange with a drab central stripe surrounding the small black median spot on each segment. This drab colour extends for a variable extent, in many Tasmanian specimens completely covering the abdomen and eliminating the orange altogether. Dorsum with rather long and fine orange to brown hairs, base of second segment with a transverse zone of silky orange to creamy hairs; side margins with long dense creamy-yellow to orange hairs, sometimes tipped with black. Venter pale grey, with short, rather scanty, silky white hairs. Genitalia as in Text-fig. 6, *a* and *b*.

♀. Frons and face paler than in the male, beard pure white. Thorax not usually quite such a dark brown. The main difference is in the abdomen, which is rather slender and of a uniform drab colour, never showing any trace of orange and consequently never having any darker patches surrounding the black median spots.

Length as under the subspecies.

Distribution.—Tasmania, Victoria, South Australia, New South Wales, Queensland.

This species is to be distinguished by the indistinctly marked thorax, by the small abdominal spots not forming a continuous stripe, and by the variable

amount of drab coloration and the absence of lateral dark markings on the abdomen. The orange of the abdomen is much duller than in *T. fulva* Walk. and the lateral hairs are different. Two subspecies and a variety may be recognized in the male. The distribution of the subspecies is different, though there may be a little mixing now at the point of contact.

(1) *T. PUNCTATA PUNCTATA* Macq.—The most variable; abdomen darker orange than in the next form and with the drab colour more extensive, often covering the whole abdomen. In general, as White (1914) observed, the larger specimens are broader and predominantly orange, while the smaller are more slender and entirely drab, except for the median black spots. Fore border of wing strongly brown. Distostyle as in Text-fig. 6, *a*.

Length: 14 to 10 mm. (one Tasmanian female measured 16 mm.).

Distribution.—Tasmania: Hobart, Launceston, St. Helens, Wynyard, St. Marys, Swansea, Devonport. Hardy also gives South Brunni Island, Wedge Bay, Dunally and Mt. Maria. The dates range from the 27th December to the 18th March, the great majority being taken taken in January. Victoria: Ringwood, Box Hill, Belgrave, Gippsland. Dates September and February. South Australia: a male and female without further data in the South Australian Museum. New South Wales: Wee Jasper, near Yass, February, 1920. This subspecies has developed in Tasmania and reinvaded the mainland, where it is interesting to note that, at any rate in Victoria, it can apparently maintain its identity alongside the other subspecies.

(2) *T. PUNCTATA ORIENTALIS*, n. subsp.—A stout variety; abdomen with the drab colour restricted to a median band surrounding the black spots and only overflowing to a small extent posteriorly in a few specimens. Fore border of wing only faintly brown. Distostyle as in Text-fig. 6, *b*. There are linking forms in the typical subspecies in coloration, but the genitalic differences are constant over a considerable series in both subspecies.

Length 15 to 12 mm.; the smaller specimens are as stout as the larger, not slenderer as in the typical subspecies, so the differences in size are not so obvious.

Distribution.—Victoria: Dandenong Ranges, no date, 2 males and 1 female. New South Wales: Barrington Tops, Mittagong, Wentworth Falls, Berowra, Toronto, Cordeaux Dam, Sydney. The dates range from the 6th December to early February. Queensland: Brisbane, 27th October, and Endeavour River. The home of this subspecies appears to be in eastern New South Wales.

Holotype ♂ and allotype ♀, both from Barrington Tops, in the Macleay Museum.

(3) *T. PUNCTATA* var. *MINIMA*, n. var.—A male and female before me differ from those described above in being very small and slender, and with the abdomen so dark that the black spots are indistinct. Wings with hardly a trace of brown. Genitalia as in *T. punctata orientalis*, nov., in company with which the male occurred at Barrington Tops. In general, this variety is like a very small Tasmanian type with the genitalia of the eastern mainland form.

Length: ♂, 8 mm., ♀, 9 mm. (the smallest Tasmanian ♂ was 10 mm. and ♀ 11 mm.).

Holotype ♂, Barrington Tops, early February, 1924, in the Macleay Museum; allotype ♀, Russell Island, December, in the Queensland Museum.

The males are usually taken hovering, but have been found feeding in company with the females on *Leptospermum* sp. White records the female feeding on the Flowering Box and resting on young wattles in Tasmania, where

this species seems to be commoner than anywhere else and is found as abundantly at sea-level as in the mountains. The distribution of the typical subspecies on the mainland is, in general, west of the Divide, that of subsp. *orientalis*, nov., on the mountains and to the east of them. The latter is much commoner on the mountains, being quite a rarity on the coast.

With regard to the synonymy, Macquart described *T. novae-hollandiae* three times, the last of these, from Tasmania, being clearly this species. White followed him in naming the Tasmanian species *T. novae-hollandiae* Macq. The other names, also proposed for Tasmanian specimens, clearly belong here. Lichtwardt considered *T. fulva* Walk. to be a synonym of *T. punctata* Macq.; he is possibly right, but on present evidence they must be considered as distinct. Hardy refers all mainland specimens of this species to *T. fulva* Walk., under which name he has placed several distinct species.

TRICHOPTHALMA FULVA Walker.

Walker, 1849, p. 235.—Lichtwardt, 1910a, p. 380, in part.—Hardy, 1924, p. 452, ? in part.

"Mas. Fusca subtus alba, thorace vittis duabus scutelloque lividis, abdomine fulvo-fusco, univittato, antennis fulvis apice nigris, pedibus ferrugineis, femoribus fulvis, alis subcinereis, ad costam subfuscus.

"Body white beneath; head clothed with white hairs above the insertion of the feelers, and more thickly covered beneath with pale yellow hairs; hypostoma tawny, and clothed with yellow hairs; eyes red, thickly clothed with white or tawny down; mouth black, a little shorter than the chest; palpi tawny, piceous at the tip; feelers tawny; third joint short-conical; bristle black, much longer than all the preceding joints; breast thickly clothed with white hairs; chest rich brown, with two livid stripes, and adorned with a fringe of golden hairs on each side and behind; scutcheon also livid; abdomen tawny, clothed with golden hairs, which form a fringe on each side; the broad dark brown stripe on the back is somewhat dilated on the sutures of the segments; legs ferruginous; hips and thighs tawny; wings slightly grey; fore borders till near their tips pale brown, which colour blends with the grey on the disks; wing-ribs and veins dark ferruginous; the other veins piceous; poisers tawny. Length of the body 4-5½ lines; of the wings 9-12 lines. West Australia."

A rather small stout species with dark brown thorax on which are two prominent fairly broad pale lines. Abdomen bright orange with a narrow median black stripe. Wings clear, brownish on fore border.

♂. Eyes rich dark brown, not quite meeting below ocelli, with long bright hairs above, creamy below. Frons and upper part of face creamy-white, with scanty pale creamy hairs; lower part of face a pale yellowish-brown; beard white. Basal segments of antenna creamy-yellow with short fine creamy hairs, third segment and style black. Proboscis about one-third longer than the head, slender and with small labellae; palpi bright brown, black at tip.

Thorax dark brown, with two pale greyish-brown fairly broad stripes which are about the same width as the brown median part; scutellum not so dark as the ground colour of the scutum. Dorsal hairs very fine, brown; lateral, postalar and scutellar hairs long and dense, rich orange in colour, here and there tipped with dark grey. Pleurae pale grey with white and creamy hairs. Legs entirely bright yellowish-brown. Wings fairly clear, rather broadly infuscated with bright brown along the fore border.

Abdomen bright orange, with a narrow median longitudinal black stripe which is somewhat widened in the middle of the segments. Dorsal hairs scanty, fine and silky, yellow; side with long bright yellowish-orange hairs; on the dorsum, towards the lateral edges of the second segment, is a large patch of rich orange hairs, and a similar one on the third segment. These patches are continuous with the lateral hairs and form a conspicuous feature of this species. Venter pale yellowish-grey with scanty silky creamy hairs. Genitalia as in Text-fig. 6, c.

Length: ♂, body 11 mm., wing 11 mm.

This description is based on three males in the Australian Museum, one from King George's Sound, Western Australia, the other two labelled Queensland and without any further data. More material and the discovery of the female are highly desirable in order to test the validity of this species, which may be recognized by the combination of well marked stripes on the thorax with the bright orange abdomen with a narrow black stripe and bright orange hair patches at the sides of the second and third segments.

There is little doubt that this is the true *T. fulva* Walk., his description being based on a Western Australian specimen and agreeing very well with those before me. The brief notes on the abdomen given in White's key (Hardy, 1924, p. 447) also fit this species, rather than any of the others which have gone under the name. For further remarks see under *punctata* Macq. and *confusa*, nov.

A single male before me, the locality and date of which are indecipherable, is very close to this species, but differs in the following respects: frons yellowish-brown with pale gold hairs, face rather dark brown with black hairs, beard creamy-yellow, palpi greyish-black. Proboscis moderately stout, with large, prominent labellae. Thoracic lines narrow and rather widely separated. Hind tibia and tarsus much darker than fore and mid. Wings clear, very faintly brown anteriorly. Genitalia as in *T. punctata punctata* Macq. Without further material it would be unwise to say more about it, but it may prove to be a distinct species.

TRICHOPHTHALMA CONFUSA, n. sp.

Lichtwardt, 1910a, p. 380, in part.—Hardy, 1924, p. 452, in part.

A small-medium sized fairly slender species, with brown thorax on which are two fairly broad pale stripes. Abdomen brownish-yellow in male, drab in female, with a rather narrow median black stripe and black side margins. Legs bright brown, hind tibia and tarsus dark brown. Wings smoky, brown along fore border.

♂. Eyes brown, distinctly separated, with brown hairs above, white below. Frons with creamy bloom and narrow black keel, hairs scanty, very fine, creamy; face brownish-grey, with creamy-yellow hairs; beard creamy-white, short and inconspicuous. Basal segment of antenna pale yellowish-brown, second segment brown, both with creamy-yellow hairs, third segment and style brownish-black. Proboscis about one-half longer than the head, of moderate thickness, and with prominent labellae; palpi brown, with creamy hairs basally, black towards the apex which is black.

Thorax like that of *T. fulva* Walk. with the same colours and the same width of stripes. Lateral, postalar and scutellar hairs a much duller, more creamy yellow. Pleurae pale grey with patches of silky white hairs. Legs pale yellowish-brown, last tarsal segment of fore and mid legs dark brown dorsally,

hind tibia and tarsus dark brown, almost black dorsally on distal tarsals. Wings somewhat smoky, deep brown along the fore border.

Abdomen rather long and narrow, bright brownish-yellow, with a black median stripe which is widened in the middle of the segments, and with prominent black side margins, wider on the anterior segments. Dorsal hairs pale yellow, silky; rather longer and less sparsely arranged at the base of the second segment; lateral hairs dense but not long, dull yellow tipped with creamy. Venter very pale yellowish-grey, with scanty fine silky white hairs. Genitalia as in Text-fig. 6, *d*.

♀. Slenderer in body than male. Ground colour of abdomen dull drab, similar to that of *T. punctata* Macq.; lateral hairs of abdomen less conspicuous than in male.

Length: Both sexes, body 13 mm., wing 13 mm. A very small male from Berowra and another from Kendall measure only 7 mm., but differ in no other respect from the usual form, in company with which they occurred.

Distribution.—New South Wales: Kendall, Berowra, Heathcote, National Park, Roseville, Como. The season is November and December, and specimens have been taken feeding on the flowers of *Angophora* sp. and *Kunzia* sp. Victoria: Bright, no date.

Holotype ♂ and allotype ♀ from Berowra, 11th December, 1923, in the Macleay Museum.

This species is easily separated from its allies by the presence of prominent lateral dark stripes on the abdomen. It is not uncommon in the coastal districts of New South Wales, and is the species usually identified as *T. fulva* Walk., the error apparently having arisen through a misidentification of one of Dr. Ferguson's specimens by White. Most of the specimens determined as *T. fulva* Walk. by Hardy belong here, and it is to this species that his notes apply best. The Queensland specimen mentioned by Lichtwardt as *T. punctata* Macq. is probably this species. The three species mentioned above form a closely related group, which has caused considerable confusion and difficulty in the past. One must wait for further material and the judgment of those who have access to the types in order to test the suggestions made here.

TRICHOPTHALMA RUFICOSTA, n. sp.

A medium-sized fairly stout bodied species, with uniformly dark grey thorax and greyish-brown abdomen with a fairly narrow dark brown median stripe and dark sublateral stripes. Legs pale brown. Wings with costal region broadly bright brown.

♂. Eyes brown, distinctly separated below ocelli; hairs brown above, creamy below. Frons with greyish-white bloom and sparse fine pure white hairs, keel short and narrow, black; face brown, shining, with some bloom and with pale yellow hairs; beard creamy-white. Basal segment of antenna bright pale yellow, second brown on medial aspect, yellow on lateral, both with short creamy-yellow hairs; third segment and style brownish-black. Proboscis one-half longer than the head, fairly stout, with prominent labellae; palpi bright yellowish-brown, black at tip, with short creamy-yellow hairs.

Scutum and scutellum blackish-grey (apparently not at all greasy), with brown hairs. Sides with dense creamy hairs mixed with some grey ones; postalar region and margin of scutellum with creamy-yellow hairs. Pleurae rather dark grey, with patches of creamy and white hairs. Legs bright yellowish-brown,

hind tibia and tarsus somewhat darker. Wings slightly smoky, broadly bright brown anteriorly.

Abdomen broad, fawn coloured, with a narrow blackish-brown median stripe, which has the appearance of linked spots. Sides of second, third and fourth segments with a well marked dark brown longitudinal band which is sublateral in position, there being a zone of rather pale fawn colour lateral to the band. Hairs brown and creamy-yellow, longer and brighter yellow at base of the second segment. Marginal hairs but little differentiated, same colour as those on dorsum. Venter greyish-white, with scanty silky white hairs. Genitalia as in *T. confusa*, nov.

Length: ♂, body 15 mm., wing 14 mm.

Holotype ♂ and one other ♂ from King George's Sound, Western Australia, no date, in the Australian Museum.

This species is nearest to *T. confusa*, nov., but is separated by the unadorned thorax and by the different abdomen.

TRICHOPTHALMA BIVITTA BIVITTA Walker.

Walker, 1857, p. 135.—Lichtwardt, 1910a, p. 381.—Hardy, 1924, p. 454.

"Nigricante fusca, albo-pilosa, subtus alba, capite albo, antennis nigris basi albis, thoracis lateribus testaceo-pilosis, abdomine vittis duabus latis pallide luteis, pedibus fulvis, alis cinereis apud costam fuscis, venis nigris, halteribus testaceis.

"Blackish brown, narrow, with white hairs, underside with white tomentum; head white, proboscis and antennae black, the latter white at the base; thorax with testaceous hairs along each side; abdomen with a broad pale testaceous stripe on each side; legs tawny; wings grey, brown along the costa, veins black, halteres testaceous. Length of the body four lines; of the wings 8 lines. Australia."

I propose to divide Walker's species into two, separating the mountain top form under a different subspecific name.

A small slender species with velvety-black thorax edged with striking yellow hairs; abdomen brownish-yellow in male, yellowish-brown in female, with a fairly broad black median stripe and narrowly black side margins, and with, occasionally, narrow black transverse bands at the apices of the segments. Legs brown, hind tibia and tarsus dark brown. Wings slightly smoky, with brown fore border.

♂. Eyes reddish-brown, just touching a little below ocelli, hairs brown above, creamy below. Frons yellowish-grey, with a narrow black keel on its upper part, with very fine white-tipped creamy hairs; face a little darker than the frons, brown round oral margin, with sparse creamy-yellow hairs below; beard pure white. Basal segments of antenna black, covered for the most part with greyish-yellow bloom, hairs creamy-yellow; third segment and style brownish-black. Proboscis one-half longer than the head, rather slender and with prominent labellae; palpi dark brown, with black hairs.

Scutum velvety-black, covered with sparse long silky golden hairs, which are rather denser in the middle, especially in front of the scutellum which is dark brown in colour. Lateral margin, postalar region and margin of scutellum with long dense dull golden-yellow hairs, forming a conspicuous zone round the thorax. Pleurae pale grey, with a dense patch of long pure white hairs anteriorly, more scattered yellow to creamy ones below wing-root, and a few long white hairs elsewhere. Legs pale yellowish-brown, last tarsal segment on fore and mid legs

dark brown dorsally, hind tibia and tarsi dark brown, especially dorsally. Wings somewhat smoky, pale brown along the fore border.

Abdomen yellow with a tinge of brown, with a broad black median stripe occupying a little less than one-third of the width of the abdomen and somewhat expanded at the apices of the segments; sides of second, third and part of fourth segments black, rather broadly so on second segment; apical edges of the segments sometimes with a narrow black transverse band. Dorsal hairs fine, pale gold, denser at base of the second segment; lateral hairs long, pale gold, rather dense on second and base of third segments, scanty further back. Venter pale yellowish-grey, with scanty fine white hairs. Genitalia as in Text-fig. 6, e.

♀. Differs from the male in the lateral hairs to the thorax, which are creamy rather than gold, and in the abdomen, the ground colour of which is yellowish-brown, though not the dull drab colour of *T. confusa*, nov. and its allies. The hairs on the abdomen are scanty and creamy in colour.

Length: ♂, body 10 mm., wing 9 mm. The ♀ is longer and may measure up to 13 mm.

Distribution.—Queensland: Brisbane, Stradbroke Island, Russell Island. Dates October and December. New South Wales: Merriwa, Gunnedah, Manly. All taken in November. Victoria: Bacchus Marsh, no date. There is no record of its occurrence anywhere on the mountains.

The character of the thorax separates this subspecies from all but *T. bivitta nigricosta*, nov. and *T. harrisoni*, nov. From the former it differs in its smaller size, in the paler wings, and in the slightly narrower median abdominal stripe. From the latter it is only to be separated safely by the genitalia of the male, but the median abdominal stripe is wider and the transverse black bands, if present, are not so prominent.

This is clearly Walker's species and the determination is confirmed by the characters given in White's key (Hardy, 1924). In this key the names *bivitta* Walk. and *bivittata* Westw. have obviously been interchanged and this error, together with a misidentification by White based on it, led Hardy to query *bivitta* Walk. as a synonym of *rosea* Macq. Lichtwardt included more than one species in his conception of *bivitta* Walk. This subspecies has sometimes been identified as *T. fulva* Walk.

TRICHOPTHALMA BIVITTA NIGRICOSTA, n. subsp.

Differs from *T. bivitta bivitta* Walk. in its larger size, in the duller ground colour of the abdomen, which does not differ in the sexes, in the distinctly broader black median band and almost entire absence of transverse bands (faintly indicated in one specimen only), and in the much darker brown, almost black colour of the anterior part of the wings. Genitalia similar.

Length: ♂, body 13 mm., wing 12 mm. ♀, 14 mm.

Distribution.—New South Wales: Barrington Tops, early February, 1925, 4 ♂♂ and 10 ♀♀, feeding on *Leptospermum* sp.

Holotype ♂ and allotype ♀ in the Macleay Museum.

This is probably the mountain form of *T. bivitta* Walk., but may possibly be a distinct species. When two forms are restricted in range, the one to the coast and the other to the mountain tops, one is, I think, just as justified in making subspecies of them as under any other conditions.

TRICHOPHTHALMA HARRISONI, n. sp.

A small species, stouter-bodied than *T. bivitta* Walk.; thorax like *T. bivitta* Walk. Abdomen brownish-orange in the ♂, yellowish-brown in the ♀, with a narrow median black stripe, narrowly black side margins and black basal and apical edges to the segments. Legs bright brown, hind tibia and tarsus darker. Wings smoky with slightly darker fore border.

♂. Eyes reddish-brown, almost meeting below ocelli, hairs dark brown to pitchy above, creamy below. Frons greyish-yellow, with an inconspicuous keel on the upper part and with short creamy hairs; face a little darker, with longer, stouter pale gold and black hairs; beard creamy-white. Basal segments greyish-black with greyish-white bloom and creamy hairs, third segment and style greyish-black. Proboscis one-half longer than the head, fairly slender and with prominent labellae; palpi dark brown, with rather short black hairs.

Thorax and legs like *T. bivitta* Walk. Wings smoky, slightly darker in cells Sc and R₁, the colour not being so conspicuous as in *T. bivitta* Walk.

Abdomen dull brownish-orange, with a narrow black median band, which is widened in the middle of the segments so as to give the appearance of coalesced spots, with very narrowly black side margins, and with black transverse bands at the bases and apices of the segments, the combined adjacent bands forming a conspicuous feature of the abdomen. Dorsum with long dark grey hairs and scattered short silky pale gold ones, the latter being longer and denser and forming a transverse zone at the base of the second segment. Sides with long pale creamy-yellow hairs mixed with grey ones, the creamy hairs are paler, longer and denser at the base of the second segment. Venter pale yellowish-grey, with scanty silky white hairs. Genitalia as in Text-fig. 6, f; the resemblance to *T. punctata orientalis*, nov., and the difference from *T. bivitta* Walk. are very striking.

♀. Differs from the ♂ in its somewhat slenderer form, in the yellowish-brown colour of the abdomen, less conspicuous black transverse markings, and in the scantier less conspicuous hairs.

Length: ♂, body 10 mm., wing 9 mm.; ♀, 12 mm.

Distribution.—Barrington Tops, early February, 1925, 7 ♂♂ and 5 ♀♀, some feeding on *Leptospermum*, some hovering under a snow-gum; also 1 ♂, same locality, 25th January, 1923, coll. Nicholson.

Named in honour of Professor Harrison, who led the expedition and who captured the first specimens.

Holotype ♂ and allotype ♀ in the Macleay Museum.

At first sight this species seems to resemble *T. bivitta bivitta* Walk. more closely than does *T. bivitta nigricosta*, nov., but a closer investigation shows that the differences are more marked than they appeared at first. It may be separated from both by the genitalia of the male, by the paler anterior margin of the wing, rather stouter habit and by the much narrower median and lateral and more marked transverse markings on the abdomen.

TRICHOPHTHALMA NICHOLSONI, n. sp.

A medium-sized species of moderate habit. Thorax dark brown with pale sides, two well defined pale lines and an indistinct median one. Abdomen pale fawn, with a broad black central stripe and black side margins. Legs brown. Wings with fore border brown.

♂, ♀. Eyes dark brown, almost meeting below ocelli in ♂, hair dark brown above, creamy below. Frons covered with brownish-yellow bloom, keel indistinct, hair sparse and short, creamy; face similar, hairs rather longer; beard rather longer than usual in this series, creamy-white. Basal segments of antenna pale yellowish-brown, with creamy hairs, base of third segment brown, remainder and style black. Proboscis about one-third longer than the head, fairly stout and with prominent labellae; palpi light brown with dark brown hairs.

Thorax dark brown with yellowish-grey side margins forming a pale band above wing-root, with two narrow well defined yellow-brown longitudinal lines, which double their width behind the transverse suture, and with a very indistinct broader median yellowish-brown line. The two lateral lines are separated by quite four times their breadth. Scutellum brown, not so dark as scutum. Dorsal hairs brown, silky; side margins, postalar region and edge of scutellum with long dense creamy hairs. Pleurae pale grey with patches of long creamy-white hairs. Legs bright brown, darker dorsally on tarsi, hind legs a little darker than fore and mid. Wings faintly smoky, dark brown on fore border, the darkening being rather broad in the middle of the wing length, but fading rapidly apically.

Abdomen broad, pale fawn, with a broad median dark stripe, which has perfectly straight edges and which occupies about one-third of the width of the abdomen. Sides of second, third and fourth segments with conspicuous dark stripes. Dorsal hairs bright brown and creamy, longer at base of second segment; marginal hairs creamy, rather dense but short, except at base of second segment, where they are fairly long. Venter greyish-white with scanty white silky hairs. Male genitalia as in Text-fig. 6, *g*.

Length: ♂, ♀, body 14 mm., wing 14 mm.

Distribution.—New South Wales: Kosciusko, 11th February, 1924, 2 ♂♂, 1 ♀, coll. Nicholson.

Holotype ♂ and allotype ♀ in the Macleay Museum.

This species and its allies may be readily separated from the rest of the series by the two narrow well-defined widely separated pale lines on the thorax and by the ninth tergite of the male. The discrimination of these species from one another is a matter of some difficulty; *T. trilinealis*, nov., is definitely distinct, since it was collected at the same time in the same situation, and differs more than the limits of variation found in the genus. It may be separated by the black sides of the scutum, the better defined median pale line, different abdominal markings, clearer wings and smaller size. *T. dubiosa*, nov., presents a more difficult problem. Though not yet taken at Kosciusko, it is a highland species and its distribution overlaps that of *T. nicholsoni*, nov. The thorax is similar, but the wings have hardly a trace of brown and the abdomen is much darker, with a narrow median dark stripe and only very small inconspicuous dark zone at the side margins. *T. griseolineata*, nov., is close, but is much smaller, and differs both in thoracic and abdominal markings. It may be the South Australian representative of one of these species. The genitalia do not help here, being practically identical in all.

TRICHOPTHALMA TRILINEALIS, n. sp.

A small fairly slender species with black thorax on which are three narrow pale lines. Abdomen brownish-yellow, with a black median stripe, very narrowly

black side margins and apices to the segments. Legs brown. Wings smoky, not darkened on fore border.

♀. Eyes dark brown, with dark brown hairs above, creamy below. Frons with creamy bloom and short sparse creamy hairs below and five or six short brown ones just below ocelli, no keel; face with creamy bloom in middle, brown at sides, with longer, more abundant black hairs; beard creamy-white. Basal segments of antenna yellowish-grey, with creamy hairs and some black ones at apex of second segment, third segment and style brownish-black. Proboscis black, nearly twice the head length, fairly slender and with prominent labellae; palpi dark brown, with strong black hairs.

Thorax blackish-brown with a very faint indication of paler colour at sides and with three narrow well defined brown longitudinal lines; scutellum dark brown. Dorsal hairs brown; lateral, postalar and scutellar hairs creamy-white mixed with dark grey. Pleurae pale grey, with patches of long white hairs. Legs brown, darker dorsally on tarsi, hind tibia and tarsus slightly darker. Wings somewhat smoky, very faintly tinged with brown in cells Sc, R and R₁.

Abdomen dull fawn, with a black median stripe, rather less than one-half the width of the segments and widened a little at the apex of each segment. Sides of all segments narrowly black, widened on posterior part of second and third segments. Posterior edge of each segment with a very narrow black transverse band. The attenuated terminal segments are predominantly black. Dorsal hairs brown; lateral hairs creamy, with patches of black apically on second and third segments. Venter greyish-white, with scanty silky greyish-white hairs.

Length: body 14 mm., wing 13 mm.

Holotype, the unique female from Kosciusko, 11th February, 1924, coll. Nicholson.

For further remarks see under *T. nicholsoni*, nov.

TRICHOPHTHALMA DUBIOSA, n. sp.

A small to medium sized moderately stout species. Thorax blackish-brown with two well defined pale lines. Abdomen yellowish-brown with a narrow black median stripe and a little black at the sides of the second and third segments. Legs brown, hind tibia and tarsus very dark. Wings with hardly a trace of brown anteriorly.

♂, ♀. Eyes dark reddish-brown, a little separated in the ♂, closest just below ocelli, hairs dark brown above, white at extreme lower edge. Frons bright yellow-brown with black keel, scanty pale yellow hairs below and a patch of short strong black hairs below ocelli in the female; face brown, with rather strong black hairs; beard white, yellowish anteriorly. Antenna with basal segment light brown with gold hairs, second dark brown with black hairs, third segment and style black. Proboscis about one-third longer than the head, fairly slender and with prominent labellae; palpi brown, with strong black hairs.

Thorax blackish-brown, with dull fawn sides forming a band just above wing-root. There are two well separated, narrow, dull yellowish-brown lines and occasionally faint traces of a median line. Scutellum dull brown. Dorsum with brown hairs; side margins with dull creamy-yellow hairs mixed with grey ones; postalar region and margin of scutellum with dull gold hairs. Pleurae grey with patches of white hairs and a few yellowish ones. Legs brown,

darker dorsally on tarsi, hind tibia and tarsus almost black. Wings somewhat smoky, with a faint trace of brown anteriorly.

Abdomen fairly broad, dull yellowish-brown, with a narrow black median stripe, less than one-third the total width of the abdomen, and narrow black margins to second and third segments. Dorsum with dull gold and black hairs, the latter on the black parts, base of second segment with longer dull gold hairs; lateral hairs thick in the male, hardly differentiated in the female, dull gold in colour, tipped with dark grey in parts. Venter as in the related species. Genitalia similar, but inner salience of distostyle slightly but definitely less developed.

Length: ♂, body 11 mm., wing 11 mm. The largest ♀ measured 14 mm.

Distribution.—New South Wales: Meldrum (Dorrigo), 23rd December, 1917; Barrington Tops, early February, 1925. Victoria: no further data, a ♂ in the National Museum.

Holotype ♂ and allotype ♀, both from Meldrum, in the Macleay Museum.

The Barrington Tops females are larger and more strikingly marked than the others, but are little different in other respects. For further notes see under *T. nicholsoni*, nov.

TRICHOPTHALMA GRISEOLINEATA, n. sp.

A small species. Thorax dark brown with two prominent slate-grey lines. Abdomen dull to yellowish-grey, with dark brown median stripe and brown sides and apex to the second and third segments. Wings brown at fore border. Legs bright brown.

♂, ♀. Eyes reddish-brown, almost meeting below ocelli in male, with brown hairs above, creamy ones round lower margin. Frons and face pale grey, with white hairs; beard white, creamy posteriorly. Basal segments of antenna pale yellow, with white hairs, third segment and style brownish-black. Proboscis nearly twice as long as head, rather slender and with fairly large but not very prominent labellae; palpi bright yellowish-brown, black at tip.

Thorax black, with sides very narrowly grey. The two fairly narrow dull grey lines are widely separated anteriorly and converge markedly towards the scutellum, which is brownish-black. Dorsum with scanty pale yellow hairs; side margins and margin of scutellum with dull creamy-yellow hairs, more whitish in female, mixed with dark grey ones; postalar tuft bright pale yellow. Pleurae grey, with patches of creamy hairs and a patch of pale yellow ones below wing-root. Legs bright yellowish-brown, hind tibia and tarsus slightly darker. Wings smoky, faintly but definitely brown along fore border.

Abdomen fairly slender, dull grey to yellowish-grey, with a dark brown median stripe, which is expanded towards the apices of the segments and which is nearly one-third of the width of the abdomen. Sides and apex of second and third segments dark brown. Dorsum with brown to dull yellow hairs, longer at base of second segment; side margins with creamy-yellow hairs, alternating with patches of black ones on second and third segments. The hairs are hardly differentiated in the female. Venter pale creamy with sparse silky white hairs. Male genitalia similar to *T. nicholsoni*, nov.

Length: both sexes, body 11 mm., wing 11 mm.

Holotype ♂ and allotype ♀ from South Australia, without further data, in the Australian Museum.

For further remarks see under *T. nicholsoni*, nov.

TRICHOPTHALMA LEUCOPHAEA Walker.

Trichophthalma degener Walker, 1849.—*T. heydenii* Hardy, 1924, *nec* Jaennicke, 1867.—*T. leucophaea* Walker, 1849, *nec* Hardy, 1924.

Walker, 1849, p. 233.—Lichtwardt, 1910a, p. 379.—Hardy, 1924, pp. 453, 454.

"Fusca, subtus alba, thorace fulvo univittato et albo bivittato, scutello utrinque albo, abdomine albo bivittato, antennis fulvis, pedibus ferrugineis, tarsis piceis, alis cinereis, ad costam fuscis.

"Body rich brown, white underneath: head white, thickly clothed beneath with white hairs; eyes piceous, thickly clothed with white down: sucker black, as long as the chest: feelers, hypostoma, and palpi tawny; the latter piceous at the tip: chest with a very slender tawny stripe in the middle, and two broader white stripes on each side; the inner white stripes are somewhat widened in the middle, whence two oblique bands of tawny hairs pass from them to the outer stripes, and join a fringe of the same colour on each side of the chest: a white semicircular band on each side of the scutcheon: breast thickly clothed with white hairs: abdomen with two white stripes, which are somewhat irregular in outline, and slightly widened on the fore borders of the segments: legs ferruginous, clothed with black hairs; thighs also clothed with white hairs; feet piceous; wings gray, slightly brown in front on half the breadth and two-thirds of the length, whence to the tips the fore borders only are brown; wing-ribs and fore border veins ferruginous; the other veins black; poisers tawny. Length of the body 6 lines; of the wings 14 lines. Western Australia."

A medium sized species with very long proboscis. Thorax with two narrow pale lines. Abdomen brown at sides, broadly dark brown in the middle, intermediate part greyish-creamy colour.

♂, ♀. Eyes dark brown, separated as much in the ♂ as is usual in the ♀ of this genus, ♀ eyes a little more widely separated, hairs brown above, white below and at sides. Frons and face covered with greyish-white bloom, pale brownish in lower part of face, hairs white, sparse and short; beard long, pure white. Basal segments of antenna greyish-brown with creamy hairs, third segment and style black. Proboscis three times the head length, fairly slender and with small inconspicuous labellae; palpi brown, with short black hairs, apically very thin, black.

Thorax rich dark brown, with greyish-white side margins forming a band above the wing-root, and with two fairly narrow stripes of the same colour, which are widened at the transverse suture and which are well separated anteriorly but converge somewhat towards the scutellum, just in front of which they broaden out medially and meet. Scutellum brown, with a crescentic grey band, which may be absent, at the posterior margin. Dorsal hairs brown and black; side margins with dense woolly dull pale yellow hairs mixed with longer stouter black ones; postalar tuft partly creamy-yellow, partly black; margin of scutellum with dull yellow hairs and some black ones. Pleurae pale grey, with tufts of long white hairs. Legs brown, hind tibia and tarsus dark brown. Wings faintly smoky, fairly broadly brown along fore border.

Abdomen broad in ♂, fairly slender in ♀, with a broad dark brown median stripe, slightly widened at the apices of the segments. Side margins with an almost equally broad paler brown stripe, these bands being also broader at the apices of the segments. The difference in colour between the medial and lateral stripes is more marked in the male than in the female. Intervening parts forming an irregular greyish-white stripe on each side, this stripe being definitely

narrower than the brown ones. All the stripes narrow towards the apex of the abdomen, the lateral ones fading out on the fifth or sixth segments. Dorsum with black and yellow hairs, base of second segment with creamy hairs, longer and yellowish towards the sides; side margins with short dense creamy hairs. Venter pale creamy-grey, with short silky white hairs. Genitalia as in Text-fig. 6, *h*, not unlike *T. confusa*, nov.

Length: both sexes, body 14 mm., wing 13 mm.

Distribution.—Western Australia: Perth, Swan River, Nedlands River, King George's Sound. Season, November.

This species is separated from all but *T. longirostris*, nov., by the very long proboscis and inconspicuous labellae. From the latter it is separated by the thoracic and abdominal markings. There is a pair in the Australian Museum which are rather larger than usual and have the thoracic and abdominal markings a little wider, but do not differ in any other respect. I cannot separate *leucophaea* Walk. from *degener* Walk., which was described immediately after it. The species before me fits both fairly well, but agrees perhaps a little better with the latter. The tawny hairs joining the thoracic stripes referred to by Walker are present in all, but are never very prominent. This species is the one recognized as *degener* Walk. and also as *heydenii* Jeann. by Hardy (1924), but not the one he indicates as *leucophaea* Walk. As mentioned before, this species bears an extraordinarily close resemblance to that described from Chili by Jaenicke as *Hirnoneura nemestrinoides*, certainly close enough to throw grave doubts on their generic distinctness.

TRICHOPTHALMA LONGIROSTRIS, n. sp.

Trichophthalma leucophaea Hardy, 1924, p. 454, nec Walker, 1849.

A medium sized fairly stout species with a very long proboscis. Thorax with two moderately broad pale lines. Abdomen brown at sides, with a narrow black median stripe and broader pale intermediate stripes.

♀. Eyes dark brown, separated as much as in *T. leucophaea* Walk., hair brown above, white below. Frons and face bright brown, with creamy bloom, hairs white to creamy, short and scanty above, longer and denser at sides of face; beard well developed, pure white. Basal segment of antenna pale yellow, second brown, both with creamy hairs, third segment and style brownish-black. Proboscis three times the head length, slender and with very small and inconspicuous labellae; palpi bright brown, with yellow hairs.

Thorax like that of *T. leucophaea* Walk., except that the stripes are about twice as wide and the median brown part is not much wider than the stripes. Scutellum entirely brown. Side margins with dense woolly dull yellow hairs mixed with longer creamy ones tipped with brown; postalar tuft and marginal hairs of scutellum creamy-yellow. Pleurae pale grey, with tufts of long silky white hairs. Legs yellowish-brown. Wings faintly smoky, brown along fore border.

Abdomen with a rather patchy light brown stripe at the sides and a narrow median dark brown stripe, which is broadened a little in the middle of the segments. Intervening pale grey stripes irregular in outline and markedly broader than any of the brown ones. Dorsal hairs mixed yellow and black; a hardly noticeable creamy fringe at the sides. Venter pale grey with short sparse silky white hairs.

Length: body 13 mm., wing 13 mm.

Holotype ♀ from north of Perth (French), in the National Museum.

This species is to be separated from *T. leucophaea* Walk. by the broader pale stripes on the thorax, and by the very much narrower dark brown median stripe and consequently much broader pale intermediate stripe on the abdomen. It is sufficiently distinct to warrant a separate name, although only one female is available. This is obviously the species referred to by Hardy as *T. leucophaea* Walk.

B.—*novae-hollandiae* subgroup.

TRICHOPTHALMA NIGROVITTATA, n. sp.

A large stout species with brown thorax; abdomen dull orange with a broad black median stripe and black side margins; wings with fore borders brown.

♂, ♀. Eyes dark brown, almost meeting for a short distance below ocelli in the ♂, hairs brown above, creamy round lower margin. Frons yellow, with an inconspicuous black keel and silky yellow hairs; face brown, bare and shining; beard short, creamy. Basal segments of antenna testaceous, with creamy hairs, base of third segment testaceous, remainder and style brownish-black. Proboscis about as long as head, stout and with prominent labellae; palpi bright brown, darker at apex, large and prominent, with sparse short black hairs.

Scutum and scutellum dark brown, with a pale spot on each side at the medial end of the transverse suture. Dorsum covered with short black hairs; side margins with long dark grey hairs, not very densely arranged; postalar tuft dark grey; margin of scutellum with long creamy hairs. Pleurae creamy, with long creamy hairs arranged in patches. Legs entirely rich brown. Wings long, faintly smoky, brown along fore border.

Abdomen with a broad black median stripe throughout its length and broad black side margins to the first four segments; remainder forming a broad, dull orange stripe on each side of the median stripe. Dorsum with short black hairs; side margins with fairly dense, but short and inconspicuous, black hairs. Venter yellow, with pale yellow hairs in the middle and bright yellow ones at the sides. Male genitalia as in Text-fig. 4, *d, e, f*; aedeagus typically with one to two teeth on each side.

Length: both sexes, body 18 mm., wing 18 mm.; smallest specimen 14 mm., largest 20 mm.

Distribution.—New South Wales: Barrington Tops and Eccleston. Dates, January and February. Queensland: Gordonvale (October) and Port Douglas.

Holotype ♂ and allotype ♀ from Barrington Tops, in the Macleay Museum.

This species has a superficial resemblance to members of the *rosea* group, and may be readily separated from its allies by the abdominal banding. It was present in considerable numbers at Barrington Tops in early February, where it was taken feeding eagerly on *Leptospermum* sp. during any sunny spells.

TRICHOPTHALMA NOVAE-HOLLANDIAE Macquart.

Hirnoneura novae-hollandiae Macquart, 1840.—*Rhynchocephalus gigas* Newman, 1841.—*Trichophthalma funesta* Walker, 1849.

Macquart, 1840, p. 19, Pl. 2, fig. 7, *a-c*; *nec* 1846, p. 101; *nec* 1850, p. 99.—Newman, 1841, p. 220.—Walker, 1849, p. 231.—Schiner, 1868, p. 110.—Lichtwardt, 1910*a*, pp. 373, 375, 377.—Hardy, 1924, p. 453.

"Thorace castaneo; abdomine fusco; pedibus rufis; alis fuscans; Long. 8 l. ♀.

"Trompe noire, abaissée perpendiculairement, égalant en longueur la hauteur de la tête, assez épaisse, à lèvres terminales épaisses; libre, soies maxillaires et

palpes testacés. Face et front châtain, à duvet d'un gris jaunâtre pâle; face un peu convexe. Yeux à duvet jaunâtre dans la partie supérieure, blanchâtre dans l'inférieure. Antennes: les deux premiers articles testacés; le troisième noir, ainsi que le style. Thorax à petits poils noirs; côtés à duvet blanchâtre et poils jaunes. Abdomen d'un brun noirâtre, à petits poils noirs; premier segment et base du deuxième à poils jaunes; ventre à poils jaunes; partie antérieure des segments testacée; oviductus châtain, à dernier article noir. Cuillerons jaunes, à poils jaunes. Ailes d'un brun grisâtre, à base et bord extérieure plus foncés. De la Nouvelle Hollande. Muséum."

A large uniformly chestnut-brown species, with bright brown legs and smoky wings suffused anteriorly with brown.

♂, ♀. Eyes blackish-brown, nearly meeting below ocelli in ♂, hairs brown above, creamy round lower margin. Frons covered with pale yellow bloom, no hairs, keel inconspicuous and covered with bloom except for a narrow median line; face bright brown, bare; beard bright pale yellow, more creamy in female. Basal segment of antenna pale yellowish-brown, second brown, both with pale yellow hairs, third segment brown at base, remainder and style black. Proboscis as long as head, stout and with prominent labellae; palpi rich brown, black at apex.

Scutum and scutellum rich brown, with, in fresh specimens, three very narrow inconspicuous paler longitudinal lines and a pale spot at the medial end of the transverse suture. Dorsum clothed with short black hairs; side margins with dense long yellow hairs, mixed with some black ones; postalar tuft yellow, with a patch of black; margin of scutellum with black hairs above, pale yellow ones below; the yellow throughout is much paler than is seen in *T. nigripes* Macq. Pleurae pale brown, with patches of yellow and creamy hairs. Legs uniformly rich reddish-brown. Wings somewhat smoky, bright brown along fore border.

Abdomen bright reddish-brown, duller brown in female, clothed dorsally with rather long black hairs mixed with a few yellow ones. On the second segment, a little anterior to the middle in the male and subbasal in the female, is a narrower inconspicuous transverse zone of pale yellow hairs. Marginal hairs yellow at base of second segment, remainder black. Venter pale yellow, with bright pale yellow silky hairs. Male genitalia like that of *T. nigrovittata*, nov.; aedeagus with one to two teeth on each side.

Length: both sexes, body 20 mm., wing 20 mm.; there are a few very small specimens, as small as 12 mm., but these do not differ in any other respect from the common type; there are also two females from North Queensland which are very large and have very long wings (body 23 mm., wing 27 mm.); in general, however, the size is very constant.

Distribution.—Queensland: Cairns, Gordonvale (10th January, 1920), Coen R., Claudie R., Banks Is. (18th January, 1920), Brisbane (6th October, 1916). Hardy also gives Stradbroke Is. and Torres Straits. New South Wales: Barrington Tops (early February, 1925, abundant; also December, 1921), Lake Macquarie, Wentworth Falls (14th and 21st December, 1923), Wee Jasper, near Yass (December, 1920). Victoria: Bright and North Melbourne. South Australia: a female in the Australian Museum, without further data. Hardy's record of this species from Western Australia is apparently based on two females of *T. costalis apicalis*, nov., in Dr. Ferguson's collection; I have seen no specimens from Western Australia.

Besides the variation in size noted above, there is also some variation in colour, some specimens being darker, others lighter than described here. The wings also vary, the large North Queensland specimens mentioned having uniformly brown wings, while others from the same State have almost clear wings. Despite the variation, this species is easily separated from *T. bancrofti* nov., by the entire absence of grey or yellow on the abdominal tergites and from *T. nigripes* Macq. by the colour, by the pale rather than mustard yellow hairs at the sides and by the characteristic genitalia of the latter. From *T. rufonigra*, nov., which it resembles very closely, it is separated by the subgroup characters. The synonymy is a little confusing, but a careful reinvestigation leads to the same conclusions that Hardy (1924) expressed. There is no doubt that this is the insect described by Macquart in 1840, but it is equally certain that it is not the species described under this name in 1846, which I cannot identify, nor that described in 1850, which is his *punctata*. The descriptions of *T. gigas* Newm. and *T. funesta* Walk. fit this species very well and can be definitely separated from *T. rufonigra*, nov., which is the only other species resembling it closely.

TRICHOPTHALMA BANCROFTI, n. sp.

A large species with a uniformly grey thorax and a yellow abdomen with a variable median grey stripe. Legs yellowish-brown. Wings almost clear, faintly brown on fore border.

♂. Eyes blackish-brown, definitely separated but closest just below ocelli, hair deep creamy, almost white round lower border. Frons with creamy bloom and a narrow median bare brown line; face bright yellowish-brown, bare and shining; beard white, short and rather scanty. Basal segment of antenna yellowish-brown, second brown, both with short inconspicuous white hairs, third segment and style brownish-black. Proboscis as long as head, stout and with prominent labellae; palpi uniformly yellowish-brown.

Scutum and scutellum uniformly grey, covered with short fine creamy hairs; side margins with creamy hairs mixed with a few black ones; postalar tuft partly white, partly black; margin of scutellum with black hairs above, white below. Pleurae a paler grey than the mesonotum, with patches of silky creamy and white hairs. Legs bright yellowish-brown, hind tibia and tarsus darker reddish-brown. Wings almost clear, tinged with brown in cells Sc and R₁.

Abdomen yellow with a faint brownish tinge, covered with short black hairs, together with very inconspicuous creamy ones at the base of the second segment and longer creamy ones at the sides of the first and basal part of the second segment; remaining segments without developed lateral hairs. Second, third and fourth segments each with a large subtriangular grey patch, which is narrow basally and spreads out broadly along the apical edge of each segment; remaining segments almost entirely grey. This grey marking varies in extent, but is always conspicuous. Pleurae creamy with yellow sides, hairs same colour, very sparse and inconspicuous. Genitalia: aedeagus with three to four teeth on each side, otherwise like those described above.

♀. Differs from the male only in the extent of the grey on the abdomen, it here forming a broad band, widened at the apices, and leaving the sides only narrowly yellow.

Length: body 19 mm., wing 20 mm.; smallest a female 15 mm. long, largest a male 22 mm. long.

Distribution.—Queensland: Eidsvold (1-20 April, 1924, Bancroft), Gayndah, Brisbane (23rd November and 2nd December), Claudie R., Hughenden, Coen R.,

Rockhampton, Lindeman Is. (20th September).

Holotype ♂ and allotype ♀ from Eidsvold, 1st April, 1924, in the Macleay Museum.

This species is closest to *T. novae-hollandiae* Macq., but differs in the grey rather than brown thorax, in the yellow abdomen with grey markings, in the scantiness of the lateral abdominal hairs, in the creamy rather than yellow beard and lateral thoracic hairs, and in the great number of teeth on the aedeagus of the male. It closely resembles *T. intermedia*, nov., but is separated from it by the subgroup characters. *T. bancrofti*, nov., was not uncommon feeding on flowers or hovering in the air at the edge of Brigalow scrubs at Eidsvold. When hovering, it seemed to delight in dodging the sweeps of the net, always returning in a few seconds to the spot from which it had just vanished. This habit, common to all Trichophthalmas, is more marked in *T. bancrofti*, nov., than in any other species that I have observed. It is named in honour of Dr. T. L. Bancroft, of Eidsvold, to whom so many workers in zoology are indebted.

TRICHOPTHALMA NIGRIPES Macquart.

Hirnoneura nigripes Macquart, 1840.—*Trichophthalma scapularis* Bigot, 1881.

Macquart, 1840, p. 20.—Bigot, 1881, p. 18.—Lichtwardt, 1910a, p. 374.—Hardy, 1924, p. 453.

"Nigra; thoracis lateribus, abdominisque incisuris flavipilosis; pedibus nigris; alis fuscis, limbo interno subhyalino. Long. 7 lin. ♀.

"L'individu type de cette espèce a eu des parties collées qui font soupçonner qu'elles n'appartiennent pas toutes à la même espèce. La tête, qui paraît avoir été collée, et dont le front est couvert de colle, appartient peut-être à une Nemestrine ou à une Pangonie. La trompe est menue, abaissée perpendiculairement, un peu plus longue que la hauteur de la tête, à lèvres terminales peu distinctes. Les yeux sont nus. Les nervures des ailes ne diffèrent pas de celles l'*H. Novae-Hollandiae*. Patrie inconnue. Muséum."

A large stout species, of uniform colour varying from bluish-grey to rich purplish-brown. Lateral margins of thorax and base of abdomen with bright mustard-yellow hairs. Legs yellowish-brown, hind tibia and tarsus black. Wings smoky, with fore border brown. Genitalia characteristic.

♂, ♀. Eyes dark brown, distinctly separated in the ♂, with creamy hairs, paler round lower margin. Frons grey to creamy-yellow, with short sparse hairs of same colour at sides; face dark greyish-brown, almost entirely bare; beard bright pale yellow. First segment of antenna bright brown, second dark brown, both with short creamy hairs, third segment and style brownish-black. Proboscis a little shorter than the head, stout and with large prominent labellae; palpi with basal segment bright brown, apical segment dark brown.

Scutum and scutellum varying from dark bluish-grey to rich purplish-brown in specimens from different localities. Dorsum with short sparse black hairs; side margins, postalar tuft and margin of scutellum with dense long bright mustard-yellow hairs, which form a very prominent zone round the thorax. Pleurae grey, with long pale yellow hairs in front, mustard-coloured ones below and behind the wing-root and creamy ones above the legs. Legs brown, often darker dorsally, hind tibia and tarsus jet-black. Wings smoky, with brown fore border.

Abdomen short and broad, varying in colour from bluish-grey to rich purplish-brown; often the abdomen is brown and the thorax is distinctly grey.

Side margins with yellow hairs, longer and more prominent at the base, and interrupted by patches of black hairs at the apices of the second and third segments; in some females these marginal hairs are not at all prominent. Venter yellowish-grey, with rather sparse silky creamy-yellow hairs. Male genitalia: shape of distal end of ninth tergite (Text-fig. 6, *k*) absolutely characteristic; aedeagus without teeth, otherwise like rest of subgroup.

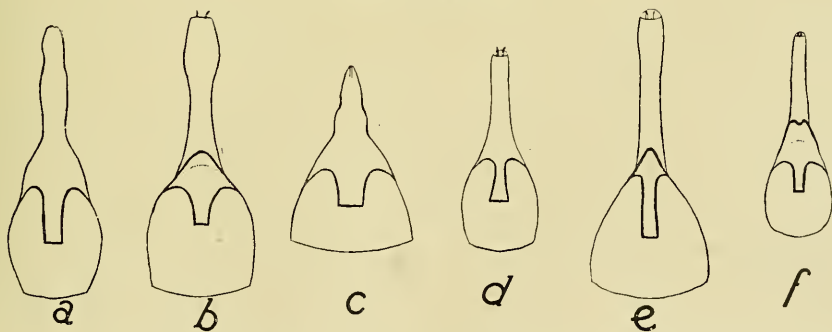
Length: body 20 mm., wing 19 mm.; smallest a male 16 mm., largest a female 24 mm.

Distribution.—Queensland: Eidsvold (29th April, 1924), Stradbroke Is. (5th December, 1913), Bribie Is. (November, 1915), Mt. Tambourine. New South Wales: Barrington Tops (early February, 1925), Hunter R., Lake Macquarie, Kendall, Broken Bay (31st December, 1923), National Park (21st February, 1925), Blue Mts. Victoria: Mordialloc.

This species is easily recognized, apart from the usually characteristic colour, by the zone of mustard-yellow hairs round the thorax, by the entirely black hind tibiae and tarsi, and by the characteristic ninth tergite of the male. The variation in colour is associated in a general way with a north-south distribution, a pair of entirely brown specimens from Stradbroke Is. forming one extreme and the very bluish-grey Victorian specimens the other. In between there are all shades, such as the Eidsvold specimens, which have a brown abdomen and a grey thorax, and a specimen from Broken Bay with a blue-grey thorax and a purplish-grey abdomen. Mountain forms in general conform to the southern type. There is a good deal of overlapping, but the general statement that brown predominates in the north and grey in the south fits the available facts very well. The season is the middle and late summer, but, like the rest of this subgroup, this species has a wide seasonal range. The habits, so far as I have observed them, are similar to those of *T. novae-hollandiae* Macq.

In regard to the synonymy, there is little doubt that Lichtwardt was correct in assigning Macquart's name to the species described above, although the original description was based on a composite badly preserved specimen. The colour of the lateral thoracic hairs is sufficiently distinctive to make his conclusion highly probable, especially in view of his statement that the description does not fit any of the species from other regions. The other references given clearly refer to this species.

C.—*rosea* group.



Text-figure 9.—Aedeagus of—*a*, *T. rosea* Macq.; *b*, *T. eques* Schin.; *c*, *T. albimaculata* Walk.; *d*, *T. primitiva* Walk.; *e*, *T. laetilinea* Walk.; *f*, *T. ricardoe* Licht.

TRICHOPTHALMA ROSEA Macq.

Hirmonoura rosea Macquart, 1846.—*Trichophthalma aurora* Walker, 1849.—*T. monotaenia* Schiner, 1868.

Macquart, 1846, p. 100.—Walker, 1849, p. 232.—Schiner, 1868, p. 110.—Lichtwardt, 1910a, pp. 376, 378.—Hardy, 1924, p. 454.

"Supra fusca subtus rosea. Thorace abdomineque vitta dorsale nigra. Pedibus rufis. Alis flavidis.

"Long. 6 l. ♀. Trompe menue, long de 2 l. Lèvres petites. Face et barbe à poils roses comme le dessous du corps. Front brun. Antennes fauves; troisième article ovale; style noir, de trois articles distincts. Yeux paraissant pointillés de noir, velus, bordés extérieurement de poils blancs. Thorax brun; une bande dorsale noire, prolongée sur l'écusson. Abdomen brun, à léger duvet grisâtre et bande dorsale noire. Pieds à duvet rose. Ailes légèrement jaunâtres; bord extérieur et base un peu roussâtres; nervures à peu près comme dans l'*H. Novae-Hollandiae*. De l'île Sydney dans l'Océanie. Coll. de M. Bigot."

A large thickset ornate species, greyish in colour, with a broad black median stripe on thorax and abdomen and black side margins to abdomen; red hair at sides of abdomen; undersurface of male rose-pink; legs bright brown, wings clear.

♂. Eyes brown, contiguous for a considerable distance below antennae, covered with relatively long and dense tawny hairs, pale round lower margin. Frons small in extent, grey-brown, covered with short black hairs; face brown, with dense long red hairs mixed with a few black ones; beard rose-pink. Antennae bright brown, apex of third segment and style black. Proboscis a little longer than the head, rather slender and with small labellae; palpi brown, covered with long hair and hidden in facial hair, structure as in Text-fig. 2, *f*.

Thorax slate-grey, covered with short fine black hairs, reddish on scutellum; there is a conspicuous median longitudinal black stripe, wider on the scutellum; side margins dark beneath the hair; there are also two black spots on each side, one behind the fore margin and one behind the transverse suture; these are always small and the posterior one may be absent. Side margins with dense long creamy hairs mixed with some black ones so as to give a grey appearance; basally, forming a narrow zone close to the edge of the thorax, these hairs are distinctly dark red in colour. Postalar tuft black in front, creamy behind. Scutellum with creamy hairs at sides, black ones behind the black median stripe. Pleurae pale grey, with dense long rose-pink hairs. Legs bright brown, hind tibia and tarsus almost black. Wings glass clear.

Abdomen greyish-yellow, with a broad black median stripe and black side margins. The hairs at the base of the second segment are long and creamy, and the rest of the abdomen bears short creamy hairs on the pale parts and black hairs on the black, these being longer and denser at the sides, where they overlie the pale marginal hairs; towards the apex of the abdomen a progressively increasing number of red hairs appears on the dorsum. Side margins with long dense hairs which are red with white tips, the red becoming more marked towards the posterior end. Venter pale grey, with long rose-pink hairs and some white ones. Genitalia as in Text-fig. 4, *g*, *h*, *i*, and in Text-fig. 9, *a*; there is no posterior prolongation of the bulb of the aedeagus.

♀. Facial hairs brown instead of red; beard, pleurae and venter white with a variable amount of rose-pink, which, however, may be quite absent. The sides of

the beard, the basal part of the hairs at the sides of the thorax and the hairs at the sides of the abdomen are always a striking red colour.

Length: body 17 mm., wing 15 mm.; the largest is a female 20 mm. long and the smallest a male 14 mm. long.

Distribution.—I have seen 150 specimens of this species, mostly from the following localities near Sydney: Woy Woy, 2nd Sept., 1923, feeding on *Leptospermum* sp. in enormous numbers; National Park, feeding mainly on *Epacris microphylla*, from 2nd August to 13th September, 1925, much more abundant in the early part of August; La Perouse, August and September (Hardy); also Lane Cove, Roseville, Narrabeen, and Gosford. Undoubted specimens of this species are from Clarence R., N.S.W., and from Stanthorpe, South Queensland, 17th September, 1923 (Perkins). *T. rosea* Macq., in the Sydney District occurs in company with *T. eques* Schin., *T. albimacula* Walk., *T. primitiva* Walk. and *T. ricardoae* Licht.

This species is readily separated from *T. eques* Schin., to which it is closely related by the rose-pink of the male, by the red at the sides of the thorax and abdomen in both sexes, and usually by the male genitalia. In some very old specimens the red and pink are very much faded, but always remains sufficiently distinctive for easy separation. Text-fig. 1 and Pl. 1, figs. 1 and 2 show the general appearance very well. There is no doubt about the synonymy quoted above. Hardy also queries *T. bivitta* Walk. as a synonym, owing to an error in identification by White. The locality "l'île Sydney" is an error of Macquart's. He several times refers New South Wales species to Sydney Island.

TRICHOPTHALMA EQUES Schiner.

Schiner, 1868, p. 110.—Lichtwardt, 1910a, p. 376.—Hardy, 1924, p. 455.

"Schwarzbraun; Rückenschild schiefergrau bestäubt mit fünf sammt-schwarzen Längsstriemen; die mittelste ganz durchgehend und auch am Schildchen, wo sie sich zu einem Fleck erweitert, fortgesetzt; die beiden nächstliegenden kurz, an der Quernaht unterbrochen und gleich hinter derselben abgekürzt, die äussersten dem Rande knapp anliegend und den Saum desselben bildend; die Behaarung oben vorherrschend bräunlich, an den Seiten fast weiss, zottig, aber mit schwarzen Härchen gemengt; Brustseiten grau, dicht zottig, blassgelblich behaart. Hinterleib mit zwei breiten, parallelen Längsbinden von schiefergrauer Färbung, welche sich nach hinten zu allmählig verschmälern und am letzten Ringe ziemlich spitz enden: diese Binden lassen die Grundfarbe auf der Mitte in einer breiten, als Fortsetzung der Rückenschildstrieme sich darstellenden Rückenstrieme und an beiden Seiten breit frei; die Behaarung an der lichter Stelle hell, an den dunklen schwarz, an den Seitenrändern durchaus weiss und dicht zottig; Unterseite weisslich und weiss behaart. Kopf braun, Untergesicht grau bestäubt und weisslich behaart; Stirne mit kurzer schwarzer Behaarung, auch die Augen dicht behaart; Fühler lebhaft rostroth, die beiden Basalglieder weiss schimmernd, der borstenartige Griffel deutlich dreigliedrig; Rüssel schwarz, Mundborsten an der Basis rostgelb. Beine lebhaft rothgelb, die Schenkel völlig weiss behaart. Flügel fast glashell, die Basis und die Subcostalader rothgelb; obere Zinke der Cubitalgabel mit der Radialader durch eine Querader nicht verbunden. 7^{mm}. Ein weibchen aus Sydney.

"Die Art gleicht im Aussehen der *Tr. monotaenia*, ist aber von ihr durch die verschiedene Zeichnung des Rückenschildes und Hinterleibes sogleich zu unterscheiden".

This species is closely related to *T. rosea* Macq., from which it differs in the following respects: Frons with brown hairs instead of black. No trace of red or pink on any part of the body; the beard, pleurae, venter and lateral hairs of the thorax and abdomen being white to creamy-yellow. Lateral dark spots on thorax variable, but always larger than in *T. rosea* Macq., sometimes almost forming a complete stripe on the anterior half of the thorax. Male genitalia (Text-fig. 9, b) with bulb of aedeagus usually produced posteriorly into a small but conspicuous lobe overhanging the tube. The female does not differ in colour or markings from the male. The length is, in general, about 1 mm. less than that of *T. rosea* Macq.

Distribution.—New South Wales: National Park, French's Forest, Galston, Woy Woy. The dates are the same as for *T. rosea* Macq., but this species reaches its maximum later. It feeds usually on *Leptospermum* sp., *Epaeris microphylla*, *Crowea saligna*, *Xanthorrhoea* sp. I have also seen specimens from Toronto and the Richmond River. Queensland: Stanthorpe, Brisbane and its vicinity, Eidsvold and Johnstone R., the last being the most northerly record for a member of this group. South Australia: A specimen without further data in the South Australian Museum may be this species, but its state of preservation is too bad for this record to be reliable.

Lichtwardt thought that this species merely represented faded specimens of *T. rosea* Macq. The abundant material now available (53 specimens) proves the separate identity of this species.

TRICHOPTHALMA BIVITTATA Westwood.

Nemestrina (Trichophthalma) bivittata Westwood, 1835, nec *Trichophthalma bivittata* Thomson, 1869.

Westwood, 1835, p. 448; 1838, p. 86.—Lichtwardt, 1910a, p. 371; 1910b, p. 601.—Hardy, 1924, p. 454.

"Thorace cinereo; capite magno; oculis fulvescenti-pubescentibus; proboscide capite longiori; abdomine nigro, vittis duabus longitudinalibus latis albis; antennis pedibusque rufescentibus; alis hyalinis; nervi costalibus at basilibus fusco-rufis, reliquis nigris.—Long. corp. (probosc. excl.) lin. 7. Exp. alar. lin. 16.

Habitat in Nova Hollandia.—In mus. nostr.—Communicavit Dom. Shuckard."

It is impossible to place this species, the description not fitting any species known to me, with the exception of two greasy specimens of *T. eques* Schin., to which species, however, I do not feel justified in allotting it in the present state of our knowledge. The general opinion of writers on the family is that it belongs to the *rosea* group, and the few indications in the original description tend to favour this view. The type may turn out to be a greasy specimen of either *T. rosea* Macq. or *T. eques* Schin. Since this species is the genotype, it is important that the type should be located and redescribed on modern lines; it is possibly in the British Museum. There is no indication in Lichtwardt's writings that he saw the type, as Hardy suggests. It is to be noted that the names *bivittata* Westw. and *bivitta* Walk. have almost certainly been transposed in White's key (in Hardy, 1924). Lichtwardt considers *bivittata* Thom. a synonym; it is certainly a homonym, but is a synonym of *T. albimacula* Walk., as Hardy points out, and I do not think that Westwood's description could possibly be made to apply to Walker's species.

TRICHOPTHALMA ALBIMACULA Walker.

Trichophtalma bivittata Thomson, 1869, *nec* Westwood, 1835.

Walker, 1849, p. 234.—Thomson, 1869, p. 476.—Lichtwardt, 1910a, pp. 380, 382.—Hardy, 1924, p. 455.

"Nigro-fusca, subtus alba, thorace albo bivittato, abdomine maculis albis bivittato, antennis ferrugineis piceo cinctis apice nigris, pedibus piceis, femoribus ferrugineis, alis subcinereis.

"Body very dark brown, white and thickly clothed with white hairs beneath; eyes piceous, thickly clothed with brown down; sucker black, dark ferruginous at the base, as long as the chest; feelers ferruginous, covered with a hoary bloom; third joint piceous, somewhat spindle shaped; chest with two white stripes; abdomen with two large nearly round white spots on each segment, with the exception of the three last, where the spots are very small; legs piceous; thighs dark ferruginous; clothed with white hairs; wings slightly grey; wing-ribs and fore border veins piceous; the other veins black; poisers tawny. Length of the body 5 lines; of the wings 10 lines. New Holland".

A medium-sized dark brown species, with two narrow grey thoracic stripes and yellow-grey abdominal spots or stripes. Wings clear. Legs deep brown.

♂, ♀. Eyes brown, meeting for a short distance below ocelli in ♂, hair brown above, white round lower margin. Frons and face pale grey, with white hairs mixed with a few black ones, longer on face; beard white with a few black hairs. Antennae with basal segments with white bloom and short white hairs, base of third segment yellow, remainder and style black. Proboscis about as long as head, slender and with small labellae; palpi brown, fairly plump, apical segment small and with well marked apical pit; the palp is covered with long hair and is almost completely hidden in facial hair.

Thorax dark brown, with pale grey side margins and two narrow longitudinal pale grey, almost white, stripes, which are widened at the transverse suture and converge somewhat posteriorly, where the grey colour mixes with the brown median part in front of the scutellum, the resulting colour being a darker grey than that of the stripes which remain distinct. Scutellum brown, irregularly grey in middle. Dorsal hairs black. The long dense hairs at the sides of the thorax are mostly white, but mixed with some black; postalar tuft black, with a little patch of white hairs; marginal hairs of scutellum creamy at sides, black in middle. Pleurae grey, with shaggy white hairs. Legs deep brown, black dorsally on tarsi. Wings clear, a little darkened in distal part of cells Sc and R₁.

Abdomen dark brown, each segment with a large subapical pale grey to creamy patch on each side of the mid line; these are variable in extent and colour, in many females adjacent patches are almost or quite continuous, the abdomen having the appearance of that of *T. eques* Schin.; the colour is grey, but varies from blue-grey to brownish-grey. Basal hairs of second segment creamy, remainder black on dorsum; side margins with dense black hairs, mixed with some white ones. Venter grey with dense silky white hairs. Two distinct types of male genitalia are found in this species. Specimens from National Park have the aedeagus exactly similar to that of *T. ricardoae* Licht. which also occurs in the same locality. The few males available from other localities have the type shown in Text-fig. 9, c. There appear to be no other differences between these two series and, though the genitalic differences are apparently constant, I do not feel justified in proposing separate names for the two.

Length: ♂, body 12 mm., wing 11 mm.; ♀, with ovipositor extended, 15 mm.

Distribution.—New South Wales: National Park, French's Forest, Bulli, Hazelbrook, Wentworth Falls, Yenda, Murrumbidgee (Hardy). The dates are all August or early September, except the Hazelbrook specimen, which was taken in December. It is one of the earliest Nemestrinids to appear, being second only to *T. primitiva* Walk. in time of appearance. Queensland: There is a single female from Eidsvold, no date, in the Gibbons Collection now in the possession of the Australian Museum. Food plants as under *T. rosea* Macq.

This species is easily recognized by the combination of narrow pale thoracic stripes with a longitudinally striped or spotted abdomen. Its appearance is well shown in Pl. I, fig. 3. From *T. variolosa* Licht. it is to be separated by the thoracic markings and by the absence of bright yellow hairs as described below. *T. bivittata* Thom. is an undoubted synonym, as noted by Hardy. The specimen in the Vienna Museum identified by Lichtwardt as *T. bivittata* Westw. was probably also this species.

TRICHOPTHALMA VARIOLOSA Lichtwardt.

Lichtwardt, 1910a, p. 386.—Hardy, 1924, p. 454.

“♂. Grosse, breite, gedrungene Art von der Gestalt der *Tr. rosea* Macq. Körper schwarz mit gelben Flecken auf dem Hinterleibe und gelber Behaarung. Kopf halbkuglig; Augen fast bis zur Hälfte der Entfernung zwischen Ocellen und Mund zusammenstossend. An den Ocellen ein Büschel schwarzer Haare. Augen sammetartig, dicht, weissgrau pubescent. Untergesicht und Kinn dicht weiss behaart. Zwischen den Fühlern ein Büschel und am Hinterrand der Augen ein Kranz hellgelber Haare. Die Oberseite des Thorax ist mit einem grauen Reif übergossen, unter welchem die aus 3 breiten Längsstriemen bestehende Zeichnung deutlich sichtbar bleibt. Der Anfang der Striemen ist ohne Reif und stellt deshalb schwarze, kurze Flecke dar, deren beide äussere ein wenig schief liegen und vor der Quernaht durch die Bestäubung undeutlich werden. Unterseite mit weisslicher Behaarung; Bauch mit weisslicher Bestäubung, durch welche die Sternite rötlich durchschimmern. An den Thoraxseiten stehen von der Schulter bis zur Flügelwurzel längere, weissgraue Haare; dicht vor der Wurzel und gleich dahinter sind die Haare hellgelb; diesen folgt wieder ein Büschel langer, schwarzer Haare an den Hinterecken. Schildchen rötlichgrau bereift, unten schwarz, an seinem Seiten- und Hinterrande mit abstehenden, gelben Haaren besetzt. Hinterleib schwarz. Auf jedem Tergit liegen je 2 gelbe Flecke neben der schwarzen Mittellinie. Der erste Tergit an der Basis des Hinterleibes trägt abstehende gelbe Haare; der zweite etwa rechteckige Flecke, der dritte halbmondförmige, am vierten und fünften nähern sich die Flecke, welche alle dem Vorderrande anliegen, ohne den Hinterrand zu erreichen, mehr der Form eines Dreiecks. Die Hinterleibsseiten sind, korrespondierend mit den Flecken, mit Büscheln gelber und schwarzer Haare geziert. Beine hellbraun; Schenkel mit wenigen weissen Härchen. Flügel im Verhältnis zu dem dicken Körper klein, hyalin. Eine besondere Eigentümlichkeit des Flügelgeäders, welche *Tr. variolosa* mit *Tr. rosea* Macq. teilt, ist das Zurückrücken von $C_1 + M_3$ gegen die Flügelwurzel. Die Stelle der Mündung in den Hinterrand des Flügels liegt ca. 2 mm. zurück gegen den sonst geraden Verlauf der “Diagonalader” (Fig. D.E.Z., p. 123, 1909). *Tr. rosea* Macq., *variolosa* n. sp., *bivittata* Westw. bilden durch diese Eigentümlichkeit zusammen mit der ganzen Form des Körpers eine Verwandtschaft, zu welcher wahrscheinlich noch *Tr. primitiva* Walk. gehört. Länge des Körpers 18 mm., Breite 7 mm.; Länge eines Flügels 13 mm., Breite 4 mm. Aus Adelaide, S.-Australien (ex coll. Saunders); Type, ein ♂ im British Museum”.

I have not seen this species, which apparently combines the thorax of *eques* Schin. with the abdomen of *albimacula* Walk., but is separated from both by the bright yellow hairs on the face, the postocular region and behind the wing-roots. It seems to be more nearly related on eye characters and body form to *T. rosea* Macq. and *eques* Schin. than to *T. albimacula* Walk. The wings are very short. The type locality is Adelaide, South Australia, a district from which I have seen very few Nemestrinids.

TRICHOPTHALMA PRIMITIVA Walker.

Trichophthalma tabanina Thomson, 1869.

Walker, 1857, p. 134.—Thomson, 1869, p. 476.—Lichtwardt, 1910*a*, pp. 381, 384.—Hardy, 1924, p. 456.

"Cana, lata, crassa, albido-pilosa, abdomine fasciato, pedibus piceis, alis subcinereis, venis nigris.

"Hoary, thick and broad, with whitish hairs which form bands on the abdomen; legs piceous; wings slightly greyish, veins black. Length of the body 6 lines; of the wings 12 lines. Australia".

A medium sized stout species, almost uniformly grey in colour, with black transverse markings on the abdomen and with short clear wings.

♂. Eyes greyish-black, contiguous for a considerable distance below ocelli, with black hairs above and white round the lower margin. Frons and face grey, with white hairs mixed with black ones; beard similar. Basal segments of antennae white with white hairs, third segment and style black. Proboscis about as long as head, slender and with small labellae; palpi black with long white hairs, well hidden, not so stout as in *T. rosea* Macq. and with apical pit distinct.

Thorax grey, with dark brown markings arranged as follows: A narrow median stripe extending the full length of the scutum; next on each side are two spots, the larger at the anterior margin and the smaller at the transverse suture; then comes a very narrow crescentic stripe extending from the anterior margin almost to fuse with the smaller of the spots just described; behind this there is a shorter broader stripe just in front of the lateral angle of the scutellum; further laterally still are two more spots, a narrower at the anterior margin and a broader just behind the transverse suture. The scutellum is grey enclosed in a brown margin. The dorsal hairs are grey, white in front of the scutellum. The dense hairs at the edges of the scutum and scutellum are white mixed with some black. Pleurae grey, with dense shaggy greyish-white hairs. Legs brown at base and beneath on femora, rest black. Wings short, glass clear.

Abdomen short and broad, segments black with basal half and apical edge grey, apical segments almost entirely grey. The black part is covered with rather short, sparse black hairs, while the paler basal half bears dense long greyish-white hairs. Side margins with alternating tufts of greyish-white and black hairs, corresponding to the markings on the dorsum. Venter grey, with dense long white hairs. Genitalia: aedeagus (Text-fig. 9, *d*) without posteriorly projecting lobe, basidistostyle larger and more upturned than in *T. rosea* Macq.

♀. The female abdomen differs from that of the male in that the black is towards the base of the segments, the apical half being broadly grey, and the basal edge being narrowly grey, the condition thus being exactly reversed. The pale hairs are much scantier and do not form the conspicuous bands seen on the ♂, the banding here being entirely due to the colour of the tergite and not to the hairs.

Length: Body 14 mm., wing 13 mm.; there is little variation.

Distribution.—New South Wales: National Park and Woy Woy; La Perouse (Hardy). This is the earliest Nemestrinid to appear and reaches its maximum before *T. rosea* Macq. becomes very abundant. The dates range from the 2nd August to the 13th September, only occasional wasted specimens being taken during the latter part of the season. Queensland: A male from Stradbroke Island, 15th July, 1906, does not differ appreciably from the Sydney specimens. Food plants as *T. rosea* Macq.

This species is readily recognized by its uniformly grey colour from all except *T. grisea*, nov., from which it is to be separated by the different thoracic and abdominal markings. Its appearance is well shown in Plate 1, fig. 4, which also illustrates the characteristic way of feeding, the legs being still while the wings are vibrating rapidly. Hardy gives *T. tabanina* Thom. as a synonym and is undoubtedly correct, although the description does not agree in all details with this species, and had Thomson's specimen been from other than the Sydney district the synonymy would not be so clear.

TRICHOPHTHALMA GRISEA, n. sp.

A rather small stout-bodied grey species, with median dark spots on the abdomen; wing short and clear.

♀. Eyes blackish-grey, separated by the full width of the ocellar triangle, with black hairs above and white ones round the lower margin. Frons with white bloom and a small bare patch of shining greyish-black just above the antennae; hairs white, collected into a tuft above the antennae and another in the middle of the frons. Face dark grey, with long white hairs mixed with black; beard longer than in *T. primitiva* Walker, white mixed with a few black hairs. Basal segments of antenna with white bloom and short white hairs, third segment testaceous at base, remainder and style greyish-black. Proboscis about the length of the head, fairly slender and with small labellae; palpi similar to *T. primitiva* Walk.

Thorax grey, with brown pattern arranged as follows: A broad median stripe on the anterior third, posterior third with a narrow median stripe, continuous with the brown one and extending to the scutellum; more laterally are three large brown spots or stripes, the anterior extending from the anterior margin to the transverse suture, the middle, which is the smallest, lies just behind the suture and is continuous with the anterior, to which it lies a little lateral, while the posterior spot is medial to the middle spot, commences just posterior to it, and almost reaches the scutellum. Scutellum grey, with brown posterior margin. The thorax in general shows much more brown than does *T. primitiva* Walk. Dorsal hairs black, sparse and short; lateral hairs long and dense, greyish-white mixed with a few black ones; marginal hairs of scutellum all jet black. Pleurae grey, with long shaggy greyish-white hairs. Legs with dark brown femora with long white hairs, rest of legs black. Wings short and glass clear; this specimen, of which only one wing is intact, has the tip of the oblique vein, M_{3+4} , absent, probably an individual aberration.

Abdomen light grey, slightly darker on the posterior half of each segment. The second, third and fourth segments each have a large round dark grey, almost black median spot. The dorsal hairs are short, sparse and black, except for the base of the second segment, which bears a transverse zone of white hairs. The marginal hair tufts are alternately black and white, the black being apical on each segment. Venter pale grey, with long shaggy greyish-white hairs.

Length: Body 10 mm., wing 11 mm.

Holotype, the unique female from Armadale, Western Australia, 1st September, 1912 (Hardy), has been returned to Mr. Hardy.

This is probably the western representative of *T. primitiva* Walk., from which, however, it differs so much as to warrant specific rather than subspecific rank. The markings on the thorax and abdomen and the black marginal hairs to the scutellum are the most striking points of difference. I have seen 59 specimens of *T. primitiva* Walk. and have found them quite constant in these respects.

TRICHOPTHALMA LAETILINEA Walker.

Walker, 1857, p. 134.—Lichtwardt, 1910a, p. 381.—Hardy, 1924, p. 455.

“♂ et ♀. Nigra, subtus cana, capite thoracisque vittis quattuor canis, abdomine fasciis duabus testaceis, pedibus fulvis, alis vix cinerascensibus, venis fulvis. ♂. Thoracis abdominisque cano-pilosis. ♀. Thoracis lateribus cano-pilosis, abdominisque lateribus nigro-pilosis.

“♂, ♀. Black; hoary and with hoary hairs beneath; head hoary; thorax with four hoary stripes, and on each side with testaceous hairs in the male, and with hoary hairs in the female; abdomen with two shining testaceous bands, sides with shining testaceous hairs in the male, and with black hairs in the female; legs tawny; wings very slightly greyish, veins tawny. Length of body 6-7 lines; of the wings 12-14 lines. Australia”.

A large stout dark brown species, with two narrow grey stripes on the thorax and narrow gold transverse bands at the apex of the second and third abdominal segments. Wings with faintly brownish tinge.

♂, ♀. Eyes dark brown, contiguous for a considerable distance below ocelli in male, with bright brown hair, white round lower margin. Frons white, with tufts of white hairs; face brown, projecting, the greater part with sparse hairs, but in the centre a dense fairly long tuft of white hairs surrounded by black ones; beard white, inconspicuous. Basal segments of antenna testaceous with short white hairs, base of third segment yellow, remainder rich brown, style black. Proboscis about one-third longer than the head, slender and with small labellae; palpi very different from those described above, easily seen and scantily haired, moderately slender and of the same thickness throughout, apical segment easily seen, twice as long as broad and with a large apical pit.

Thorax dark brown with grey margins and two fairly slender grey lines which are widened at the transverse suture and converge posteriorly, where the grey overflows the median brown in front of the scutellum, making this part predominantly grey. Scutellum brown, with an incomplete median grey stripe. Hairs on dorsum brown; lateral margin and scutellum with long dense creamy to white hairs; postalar tuft mostly black. Pleurae pale grey, with dense shaggy white hairs. Legs reddish-brown. Wings clear, with faint brownish tinge; the venation differs from other species of the group, except *T. ricardoae* Licht., in the position of M_{3+4} which, though definitely displaced, is much nearer to the rest of the oblique vein.

Abdomen dark brown with black hairs. Base of second segment grey, with a transverse zone of creamy hairs. Apical edge of second and third segments with a dense transverse band of bright pale gold hairs. Side margin with bright pale gold hair tufts, interrupted by small black tufts at the bases of the third and fourth segments. Venter pale yellowish-grey, with long fine white hairs.



Male genitalia: aedeagus (Text-fig. 9, *e*) with a small posterior lobe to the bulb; tube and also basidistostyle markedly longer, more slender and more upturned than in the species described above.

Length: Body 16-17 mm., wing 14 mm.; largest a female 20 mm. long, smallest a male 15 mm. long.

Distribution.—New South Wales: Sydney, Mosman, Ball's Head, Waterfall (Hardy), Wentworth Falls, Dorrigo. Victoria: Mallee Scrub, Narracan (Hardy). The dates range from the 28th August to 28th September in New South Wales, the later dates being for mountain specimens, and November (the Narracan specimen) in Victoria. Not having seen this species alive, I cannot say anything about its habits.

T. laetilinea Walk. and *T. ricardoe* Licht. differ from all the other species of the *rosea* group in their relatively bare face, slender prominent palpi, wing venation, abdominal markings and, to a minor extent, in the genitalia. *T. laetilinea* Walk. is most readily separated from *T. ricardoe* Licht. by its much larger size.

TRICHOPTHALMA RICARDOAE Lichtwardt.

Lichtwardt, 1910a, p. 385.—Hardy, 1924, p. 455.

“♂, ♀. Kleinere, dunkelbraune, mit weisser Linienzeichnung geschmückte Art von gedrungenem, rauh behaartem Körper. ♂. Augen dunkelbraun, dichter und länger mit weisser, in das Gelbbräunliche spielender Behaarung besetzt, wie bei irgendeiner der vorstehend erwähnten australischen Trichophthalmen. An den Ocellen wenige schwarze Haare. Stirn-dreieck, Augenhinterrand und Kinn mit dichter, langer, weisslicher Behaarung. Ebenso ist die Brust und der Bauch bekleidet; nur ist die Farbe hier mehr schmutzig gelbgrau. Thorax, Schildchen und Hinterleib in der Hauptsache braun und ebenso behaart. Von der Schulter bis zur Naht stehen dunkelbraune, von dort bis zur Hinterecke und um das Schildchen herum weisslich gelbgraue, zottige Haare; ferner dicht unterhalb dieser Franse, kurz hinter der Flügelwurzel, ein auffallender Büschel längerer, fast schwarzer Haare. Auf der Oberseite des Thorax ziehen sich 2 weisse, schmale Streifen vom Vorderrand bis zum Schildchen. Vorn mag der Abstand zwischen den weissen Streifen etwa $\frac{1}{3}$, hinten etwa $\frac{1}{4}$ der Thoraxbreite betragen. An der Basis des Hinterleibes befindet sich die gleiche, hellere, lange Behaarung wie am Schildchen und zieht sich an den Seiten bis zur Hinterleibsspitze hinab. An den Vorderwinkeln des dritten und vierten Segmentes ist die helle Franse aber wirksam durch Büschel schwarzer Haare unterbrochen. Einen besonderen Schmuck des braunen Hinterleibes bilden jedoch feine, gelbliche Seidenhärchen, welche linienförmig die äussersten Ränder der dritten und vierten Tergite bekleiden. Beine hellbraun mit verdunkelten Tarsen. Schenkel mit dünner, längerer, heller Behaarung. Flügel hyalin; eigentümlich ist dieser Art der Verlauf der “Diagonalader”: im Zickzack. Alle anderen Trichophthalmen zeigen eine gerade Diagonalader (vergl. über diesen Ausdruck D.E.G. p. 512 (1909)). Aus dem British Museum liegen mir 2 ♂ aus Adelaide, S.-Australien (R. Bakewell) vor; die ♂ messen 12 mm., das ♀ ca. 10 mm. Bei dem ♀ ist die Behaarung im ganzen kürzer und weiss, wo sie bei dem ♂ gelblich oder graulich ist; an den 4 ersten Gliedern der Legeröhre sind die kleinen Büschel schneeweisser Härchen an den Seiten besonders deutlich. Der Rüssel ist im Vergleich zu den anderen Arten dünn zu nennen. Ich widme die Art Miss Gertrude Ricardo—London in dankbarer Hochachtung für die mir geleistete Unterstützung meiner Arbeit.”

A small fairly stout dark brown species, with two narrow grey thoracic lines, and bright transverse lines or spots on the abdomen. Wings faintly brown.

♂, ♀. Eyes dark brown, contiguous for a short distance below the ocelli in the male, hairs longer than usual, rich brown above, white round lower margin. Frons and face white, with white hair and a few black ones round oral margin; beard white, with a trace of pink. Basal segments of antenna black with white bloom and short hairs, third segment creamy at the base, rest bright brown, style black. Proboscis about as long as head, fairly slender with small labellae; palpi partly hidden by hair, but easily seen, apical segment much thinner than basal, longer and thinner than in *T. laetilinea* Walk., apical pit present.

Thorax rich dark brown, with pale side margins, and marked as in *T. laetilinea* Walk., except that the grey stripes are narrower and the scutellum is entirely brown. Marginal hairs mostly creamy, with a little brown in front of the wing-root and almost pure white at margin of scutellum; postalar tuft dark grey. Pleurae pale grey, with dense shaggy white hairs. Legs with femora bright brown with long white hairs, remainder of legs much darker, almost black on tarsi; in general markedly darker than in *T. laetilinea* Walk. Wings faintly brown anteriorly, otherwise clear; venation as in *T. laetilinea* Walk.

Abdomen short and broad, chocolate-brown in colour; base of second segment with a transverse zone of long pale creamy hairs; apices of second, third and fourth segments with a narrow dense transverse band of shining creamy hairs, which are interrupted in the middle of the fourth segment and may be very inconspicuous on the second. These bands appear to be easily rubbed and vary a lot in different specimens, some hardly showing any trace of them. Side margins with dense, silky white hairs interrupted by a patch of black ones at the base of the third segment and another at the base of the fourth. These marginal hairs are not nearly so marked in the females as in the males. Venter pale creamy-grey, with dense silky white hairs. Male genitalia: like *T. laetilinea* Walk., except that the posterior lobe of the bulb of the aedeagus is larger and is bifurcate apically (Text-fig. 9, f).

Length: Body 12 mm., wing 11 mm.; largest a female 14 mm. long, smallest a male 10 mm. long.

Distribution.—South Australia: Adelaide (Lichtwardt), type locality. New South Wales: National Park, feeding on *Epacris*, 23rd August to 13th September, the rarest of the species taken there; Toronto (Ferguson), these specimens are mentioned by Hardy as a small variety of *T. laetilinea* Walk.

This species is very close to *T. laetilinea* Walk., from which it is separated by its much smaller size, entirely brown scutellum, less conspicuous abdominal bands and male genitalia. The two species appear to be constant and there does not appear to be any geographical separation. The above description, based on specimens from National Park does not agree completely with Lichtwardt's, but I feel satisfied that this is the eastern representative of his species.

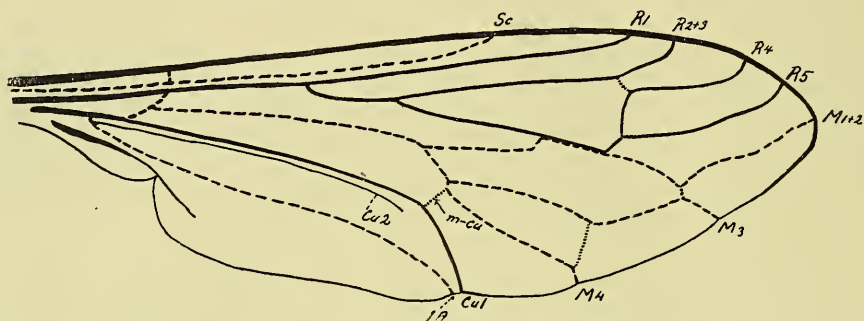
Genus EXERETONEURA Macquart.

Macquart, 1846, p. 105.—White, 1914, p. 63.—Hardy, 1924, p. 457, figs. 4 and 10.

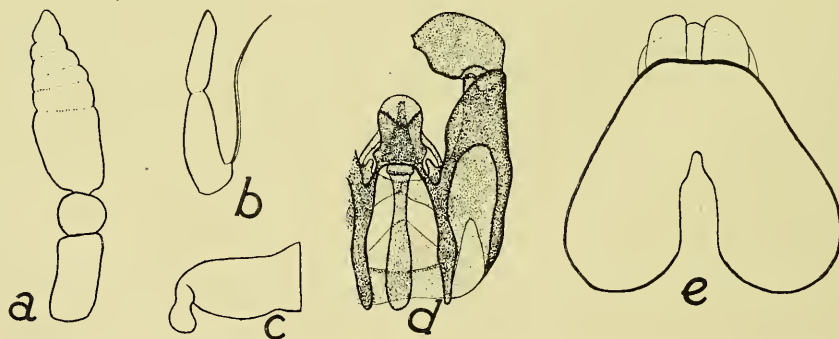
Definition.—Eyes bare, markedly dichoptic in both sexes; ocelli present. Proboscis short, Leptid-like, palpi well developed. Antennae with first and second segments short, cylindrical, third segment large, broad, laterally compressed, divided into a large basal and five small apical subsegments, no style.

Wing with R_{4+5} forked, $c-v$ between R_{2+3} and R_4 , M_{1+2} markedly overlapping R_{4+5} , M_1 and M_2 not separated beyond the oblique vein, M_4 ends in wing margin between M_3 and Cu_1 , $c-v$ between M_{1+2} and M_3 and between M_3 and M_4 , C continuous all round wing margin. Tibiae with two apical spurs, the medial spur on the fore legs being reduced or absent. Male genitalia with well developed basistyle, and large characteristic distostyle; no basidistostyle; aedeagus separate; anal lobes fairly large, membranous. Lamellae of ovipositor small and with a minute terminal lobe.

Genotype, *Exeretoneura maculipennis* Macquart, 1846. Tasmania.



Text-figure 10.—Wing of *Exeretoneura maculipennis* Macq.



Text-figure 11.—*Exeretoneura maculipennis* Macq. a, antenna; b, palp and maxilla; c, ovipositor; d, dorsal view of parts of male genitalia seen after removal of ninth tergite; e, ninth tergite and anal lobes of male.

This genus is very different from any of the other Australasian genera, and shows a confusing mingling of primitive and specialized characters. In many respects the resemblance to the Leptidae is very close. The head and eyes are distinctly of a generalized type, while the mouth parts are more specialized than those of *Trichophthalma* in the greater development of the labellae and in the reduction of the maxillae to delicate, almost hair-like structures; the palpi are of a slightly less specialized type. The antennae are Tabanid-like and the tibial spurs are also seen in the Tabanidae and Leptidae. The wing is primitive in shape, in the forking of R_{4+5} and in the disposition of M_4 , in which it is intermediate between the condition found in some specimens of *Atriadops javana* Wied.

and that characteristic of *Nycterimorpha*. The overlapping of R_{4+5} by M_{1+2} and the fusion of M_{1+2} distal to the oblique vein are, on the other hand, indications of a degree of specialization which is not seen in *Trichophthalma*.

It is difficult to assess the phylogenetic value of genitalic characters, as there are greater differences in the Tabanoidea between genera than between families, but it may be stated that these parts are much less specialized than in *Atriadops* and *Trichopsidea*. The same may be said in regard to the ovipositor, which is not unlike that of *Trichophthalma*. The general body form is more archaic than in any of the other Australasian genera. Taking everything into consideration, one may conclude that *Ezeretoneura* is the most archaic of the Australasian genera and belongs to an earlier wave of migration than does *Trichophthalma*, and that it has followed a separate line of evolution and undergone certain specializations of its own. The distribution of the genus in Tasmania and on the mountains of Eastern Australia suggests that its nearest relatives will probably be found in South America. If any Nemestrinid is found in New Zealand, it is likely to be of this type.

The habits of these flies are unlike those of any other members of the family with which I am acquainted, and resemble those of certain Leptidae, such as *Chrysophilus*, with which they have also structural affinities. At Barrington Tops, *Ezeretoneura maculipennis* Macq. was present in thousands and was always to be found clinging to grass stems, or flying in a leisurely fashion close to the ground; they were never seen feeding on the flowers where *Trichophthalmas* were so abundant. Their flight is slow and their note is little more than a dull whirring, strikingly different from the loud high-pitched characteristic note of the *Trichophthalmas*. In the mornings they were so lethargic from cold that they could be picked up in the fingers in any quantity. No information is available as to the life history.

EXERETONEURA MACULIPENNIS Macquart.

Macquart, 1846, p. 106, Pl. 9, fig. 6.—Lichtwardt, 1909, p. 651.—White, 1914, p. 64, fig. 8.—Hardy, 1924, p. 458, fig. 12.

"Nigra. Thorace cinereo tomentoso, vittis nigris; scutello testaceo. Abdomine incisuris albis. Pedibus testaceis. Alis fuscomaculatis. (Tab. 9, fig. 6).

"Long. 6 l. ♀, sans l'oviductus. Face et front noirâtres, à duvet grisâtre sur les côtés. Le premier article des antennes noir; le deuxième testacé. Abdomen noir; bord postérieur des segments à duvet blanc, ventre testacé, à duvet blanchâtre. Pieds d'un testacé terne, à duvet blanchâtre. Ailes un peu jaunâtres; une tache brune à l'extrémité des cellules basilaires; une autre plus petite à la base des sous-marginales.

"De la Tasmanie. Muséum".

A medium sized long-bodied species. Frons nearly as wide as long. Thorax dark grey with three narrow black lines. Abdomen black with narrow silvery transverse bands. Wings smoky with patches of brown.

♂, ♀. Eyes reddish-brown, bare, widely separated; anterior ocellus far removed from the others and lies midway between the vertex and the antennae. Frons grey, nearly as broad as long, with sparse long black hairs; face deeply excavated, with mixed black and gold hairs at the sides of and below the antennae. Antennae with basal segments brown, clothed with black hairs, third segment black, bare, broad and laterally compressed. Proboscis and palpi bright brown; beard white.

Thorax dark grey with paler side margins and three longitudinal narrow black lines; hairs sparse and short, mostly black with a few paler ones; side

margins with longer denser black hairs mixed with pale yellow ones. Scutellum brown. Pleuræ pale grey, with patches of dense long silky white hairs, one on proepimeron, one in front of, and one behind the wing-root. Legs yellowish-brown, darker dorsally on tarsi; hind legs all brown. Wings somewhat smoky, with three dark patches, one a little distal to the forking of Rs, another covering the forking of R_{4+5} and the third round the forking of M and of M_{3+4} ; this last may be fused with the first; there is also a slight darkening around M_{1+2} just distal to the oblique vein.

Abdomen black, segments with narrow brown hind margin and indications of brown side margins, which colour is somewhat more extensive in the female. This sex is in all respects paler than the male. Second segment with the side margins silvery; third to the sixth segment with a zone of dense silvery hairs on the hind margin, forming a narrow brilliant transverse band. Venter greyish-brown with white hairs. Genitalia of ♂ and ovipositor of ♀ as in Text-fig. 11, c, d, e.

Length: Body 14 mm., wing 12 mm.; largest a female 16 mm. long, smallest a male 11 mm. long.

Distribution.—Tasmania: Cradle Mt. (January), Hobart (March), Bellerive, on beach, March (Hardy). New South Wales: Kosciusko (February and March), Barrington Tops (January and February, very abundant).

To be separated from *E. angustifrons* Hardy by the smaller size, wider front, and the presence of mottling on the wings.

EXERETONEURA ANGUSTIFRONS Hardy.

Hardy, 1924, p. 458, fig. 13.

"Differs from *E. maculipennis* Macquart by having a very narrow front, which, near the antennae, does not exceed half its length. Head black, two tufts of yellow hairs above the antennae and the hair on the face also yellowish. Thorax blackish brown with three black median stripes; the majority of the hairs are yellowish. Scutellum brownish black. Abdomen black, which colour merges into yellowish brown at the apex on the female only; pubescence yellowish and white; venter yellow brown. Legs and veins of the wing yellowish. Male considerably more pubescent than the female and its front narrower. Length: ♂ 15 mm.; ♀ 19 mm.

"*Hab.*—Victoria: Gisborne, holotype ♂ and allotype ♀, a pair taken *in copula*, by Mr. G. Lyell, 11.3.1917; Gippsland, 1 ♂, 1 ♀, paratypes in the National Museum. New South Wales: 1 ♂ paratype from Ebor, taken by Dr. A. J. Turner, 8.1.1914. In the Queensland Museum".

Little need be added to this description, beyond noting that the wings do not show the characteristic markings of *E. maculipennis* Macq. and that the third segment of the antenna is not so broad, but that the ovipositor of the ♀ and the genitalia of the male are similar in the two. There are specimens before me from Bright and Mallee in Victoria in addition to some of the above localities.

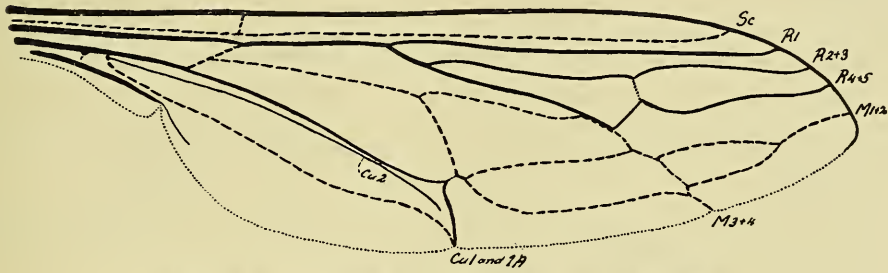
Genus TRICHOPSIDEA Westwood.

Westwood, 1839, p. 151, Pl. xiv, fig. 9, a-f.—Wandolleck, 1897, p. 250, fig. 6.—Hardy, 1924, p. 456, figs. 3 and 9.

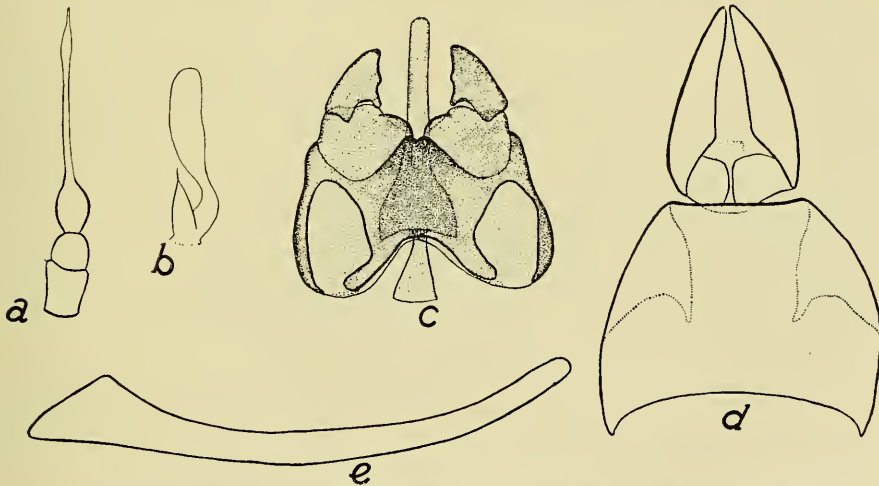
Definition.—Eyes bare, almost meeting below ocelli in ♂, widely separated in the ♀; in the ♂ the facets round the lower border are much smaller than the rest, they are uniform in size in the ♀. Proboscis a very short stiff tube; palpi a little shorter than the proboscis. Facial hair abundant, hiding the mouth parts. Antennae with basal segment cylindrical, second spherical, third small

and continuous with the unjointed style. Wings with R_{4+5} not forked, $c-v$ between R_{2+3} and R_{4+5} , M_{1+2} overlapping R_{4+5} , M_1 and M_2 fused apically, M_1 fused apically to M_3 , forking of M_{3+4} beyond $m-cu$, C ends at tip of wing. Male genitalia with basistyles, aedeagus and ninth sternite fused together, but basistyles projecting apically and bearing moderately developed distostyles; free part of aedeagus a long slender tube; anal lobes large, chitinized. Ovipositor greatly elongate.

Genotype, *Trichopsidea oestracea* Westwood, 1839. Australia.



Text-figure 12.—Wing of *Trichopsidea oestracea* Westw.



Text-figure 13.—*T. oestracea* Westw.; a, antenna; b, palp and maxilla; c, dorsal view of parts seen after removal of ninth tergite; d, ninth tergite and anal lobes; e, ovipositor.

This genus belongs to a group of related genera which have reached Australia from the Oriental Region, probably much later than the date of arrival of *Exeretoneura* or *Trichophthalma*. The small mouth parts, the reduced third antennal segment, which is continuous with the style (Text-figs. 11a, 13a, 14b are from cleared preparations), the thickset type of body with flattened head in all but the aberrant *Nycterimorpha*, the venation, and the structure of the male genitalia and of the female ovipositor (in the case of *Trichopsidea* and *Atriadops*), all serve to link these genera and to separate them from those described above. Of this group, *Trichopsidea* and *Atriadops* are older than the others, *Nycterimorpha*

being far the most specialized and aberrant Nemestrinid from this region. *Trichopsidea* is less specialized than *Atriadops* in the male genitalia, in that the fusion and reduction seen in the latter genus have not proceeded nearly so far, but the venation is a little more specialized. It was probably the earliest of this group to reach Australia. The arrangement of the facets in the male eye resembles the condition found in *Nycterimyia*. The resemblance to the Palaearctic *Dicrotrypana* is, according to Lichtwardt (1909), very close. The distribution of the genus is from New Guinea to Tasmania on the east and also North-west Australia.

TRICHOPSIDEA OESTRACEA Westwood.

Westwood, 1839, p. 151, Pl. xiv, fig. 9, *a-f*.—Macquart, 1840, p. 119, Pl. iii, fig. 1, *a-f*; 1846, p. 107.—Walker, 1849, p. 235.—Wandolleck, 1897, p. 250, fig. 6.—Lichtwardt, 1909, p. 647; 1910*a*, p. 387; 1919, p. 277.—White, 1916, p. 260.—Hardy, 1924, p. 457.

“Obscure nigra; facie marginibusque segmentorum abdominalium fulvopilosis; pedibus rufescentibus, femoribus ad basin obscuris; alis hyalinis, costa obscuriori nervisque costalibus crassioribus.

“Long. corp. lin. 4½. Expans. alarum lin. 10.

Habitat in Nova Hollandia. In Musæo nostro”.

A fairly small thickset pale golden species, with glass-clear wings and short testaceous legs.

♂, ♀.—Eyes dark brown; anterior ocellus not markedly removed from the others. Frons of ♀ dark brown with black hairs in its upper part, pale on lower half and covered with dense short pale golden hairs; that of male with yellowish hairs below point of approximation of eyes. Face with longer silky creamy-yellow hairs; beard long and dense, of same colour, completely hiding the mouth parts. Antennae orange-yellow.

Thorax grey, with darker markings and with alternating patches of black and shining pale gold hairs, which seem to form an irregular pattern; side margins and scutellum with long dull creamy hairs. Pleuræ pale grey, with abundant long creamy hairs. Legs short, rich orange in colour, hind legs darker. Wings glass-clear with brown veins.

Abdomen short and broad, segments with basal half black and apical half brown; all the brown and part of the black covered with silky pale golden hairs, which form broad bright transverse bands. Venter adorned similarly to the dorsum. Male genitalia and female ovipositor as in Text-fig. 13, *c, d, e*.

Length: Body 12 mm., wing 13 mm.; length of ovipositor 3 mm.

Distribution.—New Guinea (Lichtwardt). North-west Australia: Broome, 15th November, 1911 (French) in the National Museum. Queensland: Port Denison, Eidsvold, Toowoomba. Dates 30th November to 15th March. New South Wales: Como, 18th December, 1897, a male in the Macleay Museum; two other specimens without further data. Victoria: Bunyip (Hardy). Tasmania: Recorded by White, Macquart and Walker.

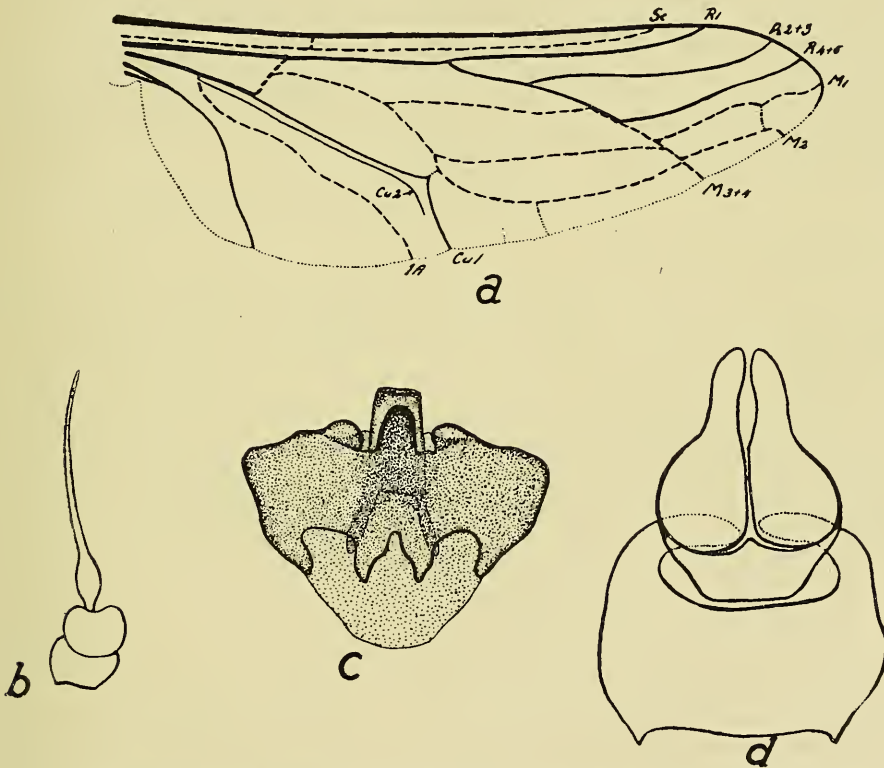
These flies are very active in their flight and are exceedingly difficult to capture. They hover motionless close to the ground for a few seconds and then dart away a few feet or yards, to hover there for a little while; they never remain long in the one spot or return to it as do the Trichophthalmas. They have not been observed feeding, nor is anything known of the life history.

Genus ATRIADOPS Wandolleck.

Colax Wiedemann, 1824, *nec* Hubner, 1816.

Wandolleck, 1897, p. 246.—Wiedemann, 1824, p. 18; 1830, p. 260.—Lichtwardt, 1909, p. 649.—Hardy, 1924, p. 456, figs. 2, 8.

Definition.—Eyes bare, nearly meeting in ♂, markedly separated in ♀; *ocelli absent*, but ocellar triangle present. Antennae very small, first and second segments short and broad, third greatly reduced and continuous with a long style. Proboscis and palpi invisible; facial hair abundant. Wings with R_{4+5} unforked, M_{1+2} overlapping R_{4+5} , M_1 and M_2 separate beyond oblique vein, M_4 either joining M_3 or ending in the wing margin between M_3 and Cu_1 , C apparently ending at apex



Text-figure 14.—*Atriadops javana* Wied.; a, wing; b, antenna; c, parts seen after removal of the ninth tergite of the ♂ (dorsal view); d, ninth tergite and anal lobes.

of wing, crossveins inconstant. Genitalia with ninth tergite produced ventrally into hook-like processes and with all parts of ninth sternite fused together and to aedeagus; distostyle no more than a small projection, free part of aedeagus a short broad tube; anal lobes large, heavily chitinized. Lamellae of ovipositor exceedingly long and thin.

These flies were thought by the older writers to be related to the Oestridae, and the superficial resemblance to members of that family is rather striking. The most interesting features about this genus are the absence of ocelli, and the great reduction and simplification of the parts of the genitalia made up from the ninth sternite and its appendages, together with the increase in size and strength of the ninth tergite and anal lobes, all these modifications being carried in this genus far beyond the condition found in *Trichopsidea*. The venation presents certain interesting features. M_4 may end in M_3 , as shown in Text-fig. 14, *a*, or it may end in the wing margin basal to, but quite close to, M_3 . The *c-v* between M_1 and M_2 may be absent, while the position of M_2 , ending well behind the apex of the wing, is unusual. The accessory crossveins joining M_4 to the hind margin vary from one to four in number. C appears to end at the apex of the wing, but is so pale that it is difficult to determine just how far it extends. The distribution of the genus is wide, species being known from South America, Africa, and from the Oriental and Australian Regions, the last two forming a continuous distribution of one species. One must note that there are definite venational differences between the species from the separated areas of distribution, but that the figures of the entire insects show a marked similarity throughout.

ATRIADOPS JAVANA Wiedemann.

Colax javanus Wiedemann, 1824.—*C. variegatus* Westwood, 1848.—*Atriadops westwoodi* Lichtwardt, 1909.

Wiedemann, 1824, p. 18, Pl. i, fig. 8; 1830, p. 26, Pl. ix, fig. 11.—Westwood, 1848, p. 118, Pl. 18, fig. 5.—Walker, 1850, Pl. v, fig. 4.—Wulp, 1886, p. 26; 1896, p. 69.—Wandolleck, 1897, p. 246, fig. 1.—Lichtwardt, 1909, pp. 649, 650.—Hardy, 1924, p. 456.

“Fühler rot; Untergesicht gelblich bis licht-graulich, weisslich behaart, Stirn licht braungrau mit grauweisslichen Haaren. Seiten des Rückenschildes und Brustseiten sehr stark weiss behaart. Hinterleib querrunzelig, die Spitzenränder der Abschnitte nämlich erhoben. Flügel braun, an der Rippe ein wenig lichter, gegen die Spitze hin mit einem weisslichen Flecke unter der Rippe; am inneren, fast wasserklaren Rande einige schwärzlich braune Punkte, von welchen der der Wurzel nächste grösser ist, Schwinger gelblich. Schenkel ocherbraun, Schienen und Füsse gelblich, 3 ziemlich schmale Pulvillen”.

A medium sized thickset species, dark brown in colour, with dark brown wings mottled with white and with short brownish legs.

♂, ♀. Eyes brownish-black; frons dark brown with short pile and scattered brown hairs; antennae brown, sunk beneath a transverse groove; facial hair dense, brown above in middle, white at sides and below. Thorax dark brown, almost black, covered with brown hairs which are denser and longer at the sides and round the scutellum, where they merge into long creamy hairs at the edges of the mesonotum; a marked postalar tuft of long dense silky white hairs; pleurae light brown, with long dense creamy and brown hairs. Legs short, stout and rather hairy, femora brown, rest of legs yellowish. Wings dark brown with a white patch extending from R_1 to the middle of that part of the oblique vein formed from R_{4+5} ; the posterior margin is variable, being in some specimens (*javana* Wied.) clear, in others (*westwoodi* Licht.) markedly darkened, while sometimes it is impossible to say to which group a specimen should be allotted; similarly the small dark markings on the clear zone are quite variable in number and extent, even in the two wings of one specimen; there are also variable patches of paleness in cells M, Cu_2 and 1A. Abdomen short and broad, dark reddish-brown.

with transverse zones of shining brown hairs; venter reddish-brown with silvery hairs. Male genitalia as in Text-fig. 14, *c* and *d*. Ovipositor as in *Trichopsidea oestracea* Westw. (Text-fig. 13, *e*).

Length: Body 11 mm., wing 11 mm.; largest 14 mm., smallest 9.5 mm.

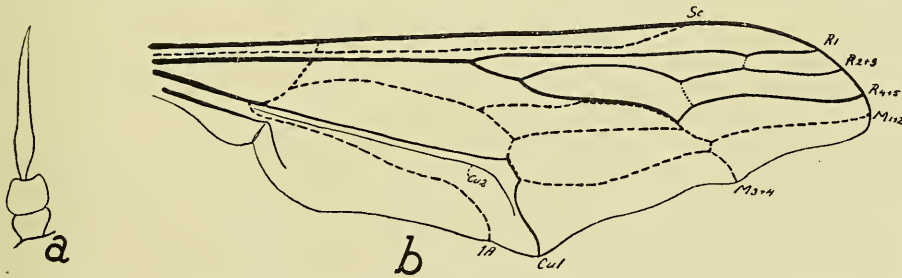
Distribution.—In the Oriental Region this species has been recorded from Ceylon, China, Sumatra and Java. In the Australasian region Lichtwardt gives New Guinea, and Palmerston and Cape York in North Queensland. Specimens are before me from Cape Greville, Port Curtis, Port Denison, Gayndah, Brisbane (several) and Toowoomba in Queensland. In New South Wales there are two males from Coff's Harbour (14th February, 1924, Ferguson). The Brisbane dates are early January, with the exception of one female taken in February. The Toowoomba specimen was taken on the 4th December.

In regard to the synonymy, Lichtwardt sinks *variegata* Westw.; I find that Westwood's description and figure agree very well with the specimens before me. I have seen specimens which correspond with *westwoodi* Licht., as well as some which agree with *javana* Wied., besides intermediates. Not having been able to find any characters in the genitalia or other parts on which they could be separated, I have reduced Lichtwardt's name to synonymy. Dr. Ferguson informs me that he took one of his specimens clinging to a grass stem with the legs bunched together and the body standing out at an angle from the stem. There is no other information available as to the habits.

Genus NYCTERIMYIA Lichtwardt.

Lichtwardt, 1909, p. 647.—Bequaert, 1925, p. 18.

Definition.—Eyes bare, facets in male larger above than below; ocelli present. Antennae with basal segments short and broad, third segment constricted at base



Text-figure 15.—*a*, Antenna of *Nycterimyia papuana* Beq. (after Bequaert, 1925); *b*, wing of *N. horni* Licht. (adapted from Lichtwardt, 1912).

and forming little more than a part of the style, with which it is continuous. Proboscis and palpi not visible; face deeply excavated, facial hair abundant. Legs incrassate. Wings with R_{4+5} not forked, M_{1+2} overlapping R_{4+5} , M_1 and M_2 not separated beyond oblique vein, M_1 ending in M_3 , *c-v* between R_1 and R_{2+3} and between R_{2+3} and R_{4+5} , Cu_1 in some fused for a little way with M_4 , thus eliminating *m-cu*; wing margin has characteristic wavy outline, C ending behind apex in some if not all. Genitalia of male and female not described.

Genotype, *Trichopsidea dohrni* Wandolleck, 1897. Sumatra.

The genus seems to be closely related to *Atriadops* Wandol., the general appearance, judging from Wandolleck's figure, being very similar and the mouth

parts, antennae and venation also indicating close affinity. The legs, however, are much modified and the venation indicates a further degree of specialization in the fusion of M_1 and M_2 . The ocelli are here retained, though lost in *Atriadops*. The genus is recorded from Natal, Formosa, Sumatra, Mapor, Andaman Is., New Guinea and Queensland. Four of the seven known species are from Indo-Malaya and two from the Australasian Region.

NYCTERIMYIA HORNI Lichtwardt.

Lichtwardt, 1912, p. 27.—Hardy, 1924. p. 459.

“Ein ♂ aus Kuranda, Nord-Queensland II, 1910, Type im Deutsch. Entom. Mus.

“Die schöne, zimtbraune Fliege ist der *N. Dohrni* Wand. so ähnlich, dass ohne Flügelabbildung eine Beschreibung recht schwer wäre. An dem flachen Kopf ist nur der Ocellenhöcker schwarz. Die Augen, welche im unteren Drittel kleine Facetten, in den oberen Dritteln aber deutlich grössere zeigen, sind durch einen schmalen, vertieften Einschnitt getrennt. Bei den Weibchen, wenigstens bei den beiden mir bis jetzt bekannt geworden, ist die Facettierung der Augen gleichmässig. Im übrigen ist der Gattungsdiagnose etwa noch anzufügen, dass die Ecken der Flügel bei den einzelnen Arten verschieden gebildet sind, Der Hauptunterschied der neuen Art (Fig. 1) liegt in der Lage der Fensterflecken der Flügel. Das Fenster in der Analzelle der *N. Dohrni* ist breit und nach vorn ziemlich gerade abgeschnitten; bei *N. Horni* n. sp. ist der Fleck vorn konkav mit einer langen, spitzen Zunge an der oberen Ecke. Erstere Art zeigt in der hinteren Basalzellen ein grosses rundes Fenster; bei der neuen Art ist die genannte Zelle bis auf zwei ganz kleine Fleckchen dunkel. Länge des Körpers 9 mm., des Flügels 11 mm.

“Ich benenne die Art Herrn Dr. Horn-Dahlem zur Ehre”.

Unknown to me.

NYCTERIMYIA PAPUANA Bequaert.

Bequaert, 1925, p. 18, fig. 2.

“Type male from ‘Baie du Geelvink, New Guinea’ (Raffray and Maindron Coll., 1878). In the collection of the Paris Museum.

“A medium sized, robust, brown black species, covered with a dull, reddish brown tomentum; legs and antennae testaceous. Pilosity brownish grey on head and thorax; abdomen almost destitute of hairs. Wings long, deeply bisinuate along the posterior margin, deep reddish brown; an elongate and narrow hyaline streak in the fourth posterior cell and faint indications of hyaline in the centre of the combined first and second posterior and of the second basal cells.

“*Male*. Integument apparently black, though the body is so uniformly covered with tomentum that it is difficult to see the proper color. Antennae and legs pale testaceous; coxae more brownish; apical half of claws brownish black.

“Head and thorax with abundant, long, erect, brownish grey pilosity, which is denser on the ventral side. Hairs of the abdomen very short and sparse, dark grey; somewhat more abundant and longer ventrally and on the sides of the second tergite. Coxae and femora with moderately long, reddish grey hairs; the pilosity of tibiae and tarsi much shorter, but of the same color. Head, thorax, and abdomen are covered with a dull cinnamon red bloom. There are no traces of dull stripes on the thorax nor of spots on the abdomen; but the second tergite bears close to its base a deep, transverse groove, which is shiny except on the middle; in addition there is a short, transverse, shiny depression on the side of each of the tergites 2, 3, 4, and 5.

"Head large, much flattened, a little broader than the thorax; semielliptical in profile and from above; kidney-shaped and nearly twice as wide as high when seen in profile. Front narrowly triangular, widest at the antennae where it measures about one-half the width of the eye; the inner orbits strongly converging above, where they come extremely close together for a short distance below the anterior ocellus, though not actually touching. Vertex triangular. Ocellar protuberance quite prominent, short, deeply divided behind from the inner orbits which project a considerable distance beyond the occipital margin of the vertex. Ocelli large, of about the same size, placed in an equilateral triangle. Eyes bare, composed in their upper half of large facets which gradually merge into the much smaller ommatidia of the lower half. Antennae (Text-fig. 2, *a*) very small, placed a short distance from the inner orbits on the upper portion of the curved slope which leads into the deep transverse depression that separates the front from the face; basal segment short, much thicker than long, widened and crescent-shaped at the apex; second segment disk-shaped, almost circular from the side, as long as the first; third segment apparently fused with the style, the whole being over twice the length of the two basal segments together, extremely slender and narrow, strongly tapering from the basal third to the apex which is very sharply pointed. Front regularly curved from vertex to antennae, below which it droops deeply into a very pronounced transverse groove separating the face. Face sunken between the eyes, the median, shorter portion sharply divided from the lateral areas by deep, vertical grooves. Palpi and proboscis, if present, extremely reduced and not to be distinguished among the long pilosity. Body broad and thickset. Thorax about as thick as, but shorter than, wide; its dorsum distinctly convex. Transverse suture well marked on the sides, over less than one-third of the width of the dorsum, obliquely continued behind to a short distance from the scutellum. Scutellum large, nearly elliptical, its posterior margin not separated from the disk. Abdomen broad and short, but little longer than wide, quite convex dorsally and somewhat curved down at the apex. The several segments are distinctly constricted, their apical portion being slightly swollen. The first tergite is very short and mostly covered by the scutellum. Second tergite much the longest, about as long as the two following tergites together; in its basal half it is broadly grooved transversely, the bottom of the channel being shiny (except medially) and finely alutaceous; in addition there is on the posterior third of the tergite on each side a short, narrow and rather shallow, transverse groove, where the integument is also shiny and alutaceous. Third, fourth, and fifth tergites of about equal length, each on the sides, shortly behind the anterior margin, with a short, transverse shiny groove similar to that found on the hind third of the second tergite. The apical tergites are much shortened and somewhat retracted ventrally; they end in a prominent knob containing the large genitalia. Legs long and stout; the hind legs considerably longer than the anterior and middle pair. Fore and mid femora moderately and rather uniformly swollen, much thicker than the tibiae; hind femora elongate club-shaped, distinctly swollen toward the apex. Tibiae slender, not appreciably thickened at the apex. Tarsi short, narrower than the tibiae.

"Wings (Text-fig. 2, *b*) long and moderately wide, over three times as long as the greatest width, which lies at the apex of the anal cell. The fore margin quite straight; the hind margin wavy between the tip of the fifth longitudinal vein and the apex of the wing; of the two deep sinuations the proximal one, between the tips of the diagonal and fifth veins, is much the longest. Alula small, but quite well developed (as figured by Lichtwardt for *N. horni* and allies).

Epaulet and basicosta clove-brown. Wings of a deep brown, opaque color, with a distinct cinnamon-red tinge. A whitish hyaline, narrow, somewhat curved, longitudinal streak, with a pearly sheen, occupies the center of the fourth posterior cell (the cell immediately below the discal); it begins quite a distance from the base of the cell, where it is widest, and gradually tapers to a short distance from the diagonal vein. There are no other well marked hyaline spots; but the center of the combined first and second posterior and of the second basal cells is distinctly subhyaline and there is even a faint indication of a hyaline area in the second basal cell. The two wings are exactly alike in this respect. Veins bright reddish-brown, darker basally. Venation as in the other species of the genus; in detail it agrees best with Lichtwardt's figure of *N. kertézi* (*Entom. Mitteil.*, i, 1912, Pl. ii, fig. 2), but the short cross-vein which unites the first and second longitudinals is much further removed from the long cross-vein connecting the second and third longitudinals. It should also be noted that the auxiliary vein (or subcosta), which both Wandolleck and Lichtwardt figure as uniting with the first longitudinal about the middle of the wing, really continues its course independently to near the base, as in other Nemestrinidae; furthermore, it is connected, a short distance from the base, with the costa by a humeral cross-vein, apparently overlooked by these authors. The apex of the discal cell is far removed from the base of the combined first and second posterior cells. The costa extends to beyond the tip of the fourth longitudinal vein, whence it gradually fades away to the apex of the wing.

"Total length, 11 mm.; greatest width of abdomen, 5 mm.; length of wing, 13.5 mm.; greatest width of wing, 4 mm.

"The species is closely allied to *N. dohrni* and to *N. horni*, but differs conspicuously in the markings of the wing".

Unknown to me. These two species may be separated by the clear areas on the wings, *N. horni* Licht. having, in cell 1A, a large clear area which is concave anteriorly with a long sharp projection from its upper angle, and also two small clear spots in cell M. In *N. papuana* Beq. there is apparently no clear area in cell 1A and only an indication of one spot in cell M; there is also a clear area in cell M₃, which is not seen in *N. horni* Licht.

Genus NYCTERIMORPHA Lichtwardt.

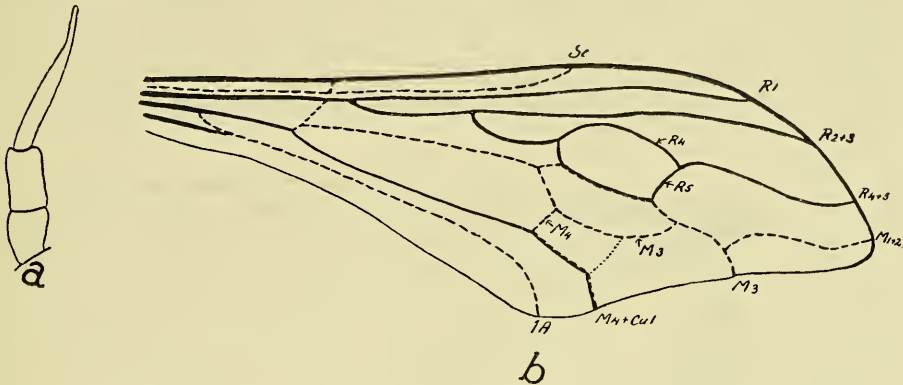
Lichtwardt, 1909, p. 648.—Hardy, 1924, p. 459, figs. 5 and 11.

Definition.—Eyes bare; ocelli present. Antennae with basal segments large and cylindrical, third segment merely part of the style. Proboscis not apparent, palpi conspicuous; face bare, deeply excavated. Legs incrassate. Wing very remarkable, hind angle absent and shape characteristic, R₄ and R₅ fused apically only, enclosing a small cell R₄, M₁₊₂ overlapping R₃ markedly, M₁ and M₂ not separated, M₄ joined to Cu₁, a *c-v* present between M₃ and M₄+Cu₁, limit of C not determined. Genitalia of male and female not described.

Genotype, *Nycterimorpha speiseri* Lichtwardt, 1909. Cairns.

This genus is very aberrant in body form and in the shape of the wing and in the venation. In the presence of a *c-v* between M₃ and M₄, in the disposition of M₄ and in the prominent palpi, there seems to be an indication of affinity with *Exeretoneura* Macq. but in other respects, and especially in the legs, the relationship to *Nycterimyia* Licht. is very close. The genus is certainly very peculiar and it is impossible to say any more without a careful study of actual specimens. The interpretation of the venation given in Text-fig. 16, *b* is purely tentative,

it being especially difficult to homologize the veins of such an unusual type in the absence of specimens.



Text-figure 16.—*Nycterimorpha speiseri* Licht.; a, antenna (after Hardy); b, wing (modified from Hardy and Lichtwardt).

NYCTERIMYIA SPEISERI Lichtwardt.

Lichtwardt, 1909, p. 648, fig. 6.—Hardy, 1924, p. 459, figs. 5 and 11.

“♂. Eine zierliche Fliege von etwa 6 mm. Länge, deren 8 mm. lange Flügel durch die schmale Basis noch länger erscheinen, als sie in Wirklichkeit sind. Das ganze Tier ist zart hellbraun gefärbt. Der Thorax, die Spitze der Hinterschenkel und die merkwürdig breiten, keulenförmigen Hinterschienen etwas dunkler. Auf der Mittellinie des Hinterleibes treten Spuren von dunkleren Fleckchen auf; besonders ist das Fleckchen auf dem zweiten Ringe deutlich, weil die Basis des Hinterleibes und das erste Drittel dieses Ringes schneeweiss gefärbt sind. Die Schwinger haben weisse Stiele und braune Köpfchen”.

Unknown to me.

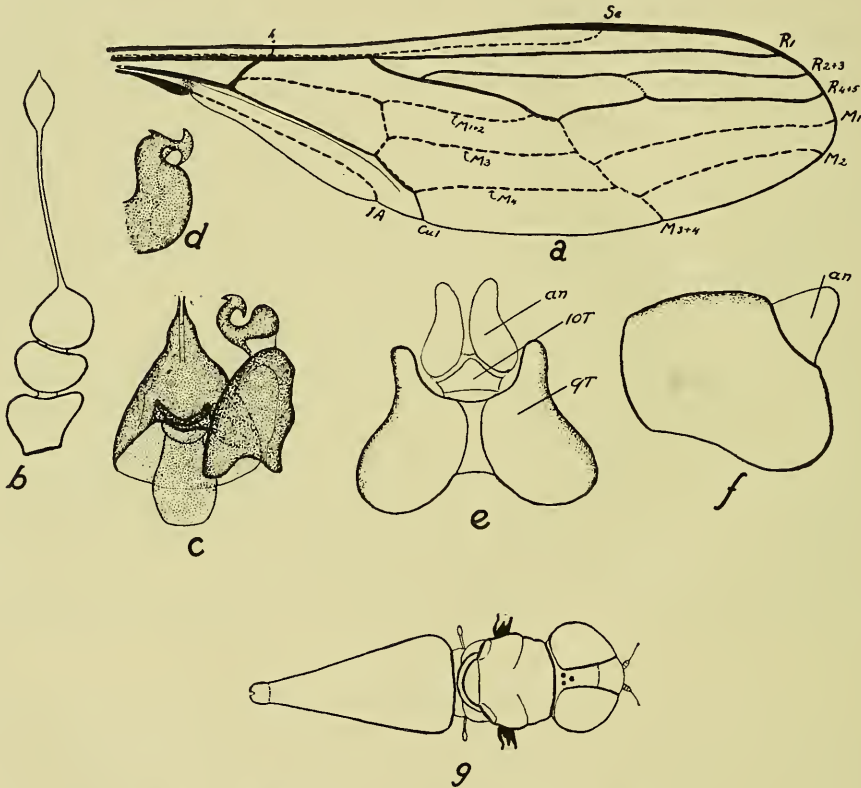
Distribution.—Queensland: Cairns (Lichtwardt); Tambourine Mt. (Hardy).

The Genus *CYCLOPSIDEA*, n. gen.

Definition.—Head large, rounded; thorax very small; abdomen elongate, tapering. Eyes large, subspherical, dichoptic in male, bare, facets small and of uniform size throughout; ocelli present. Proboscis visible, but very small and hardly projecting beyond the epistoma; palpi very small, conical. Antennae small, of three subequal segments and with a slender style, which appears to be continuous with the third segment and which bears apically a flattened leaf-like expansion. Wing with hind margin cut away and apex evenly rounded; C continuous all round wing margin, markedly thickened in its distal part anteriorly; R_{4+5} unforked, M_{1+2} overlapping R_{4+5} for a short distance, M_1 and M_2 separate distal to the oblique vein, M_1 fused with M_3 distally, M_1 fused with Cu_1 for a short distance thus eliminating *m-cu*; there is a *c-v* between R_{2+3} and R_{4+5} . Male genitalia prominent, with a large ninth tergite which is deeply excavated in the middle of its distal edge, ninth sternite large and continuous with the basistyles which are well developed, distostyle of complicated shape, basidistostyle absent; aedeagus forming a large bulb and short tube, elements fused together; tenth segment and anal lobes small, the latter membranous.

Genotype, *Cyclopsidea hardyi*, n. sp.

In the introduction I mentioned that Mr. Hardy had discovered a new genus. I have now to offer him my very grateful thanks for affording me the opportunity of examining and describing this very extraordinary fly. Superficially it resembles a Bombyliid of the genus *Geron*, or even more closely a Pipunculid, rather than a Nemestrinid. This peculiarity in body shape, which is shown in Text-figure 17, *g*, together with the small size and unusually shaped wings, is the most striking feature of this genus and, so far as I can determine,



Text-figure 17.—*Cyclopsidea hardyi*, n. sp.

a, wing; *b*, antenna, cleared preparation; *c*, dorsal view of parts underlying the ninth tergite; *d*, lateral view of distostyle; *e*, ninth and tenth tergites and anal lobes in dorsal view; *f*, lateral view of ninth tergite and anal lobes; *g*, dorsal view of body as a whole; 9T, ninth tergite; 10T, tenth tergite; *an*, anal lobe.

quite unique in the family. The mouth parts and antennae resemble those found in *Atriadops* Wand. and its allies, but the third antennal segment is not so reduced as in any of those genera; it is interesting to note that *Trichopsidea* Westw. shows the same expansion of the distal end of the style but in a much less developed condition. The venation is also closely similar to that of *Atriadops* Wand. and *Nycterimyia* Licht., while the absence of the hind angle is also seen in *Nycterimorpha* Licht., but the shape of the distal end of the wing, the con-

tinuous costa and the thickening of the costa anteriorly separate this genus widely from the others. The thickening of the costa and the absence of the hind angle of the wing approach the condition seen in *Stenobasipteron* Licht., but I feel confident that the resemblance is merely homoplastic, as in all other respects the species before me is quite unlike any placed in the African genus. Similarly, the absence of the hind angle cannot be taken as indicative of any close affinity with *Nycterimya*. Licht. On the other hand, the continuous costa and the rounded distal end of the wing, together with the slender body form, dichoptic eyes and the shape of the ninth tergite, basistyle and distostyle, might suggest relationship with *Exeretoneura* Macq., while the aedeagus, tenth segment and anal lobes are exactly like those of some species of *Trichophthalma* Westw. It must be remembered that many of these resemblances are due to the common possession of primitive features, which do not necessarily indicate close relationship, while the similarity in body and wing shape to *Exeretoneura* Macq., when analysed, is more apparent than real. The dichoptic eyes and the character of the ninth tergite and aedeagus must, however, be taken into consideration and these throw some doubt on the conclusions expressed below. Nevertheless I believe that the antennae, mouth parts and venation must for the present be accepted as of greater value and that this genus is more nearly related to the *Atriadops* series than to any of the others, but is much more primitive in most respects and diverged from the common stem at a very early stage of development. Consequently, the presumption is that its ancestors reached Australia from the Oriental Region. The character of the ovipositor of the female, when that sex is found, will probably be of great assistance, but the discovery of some form intermediate between this and some other known genus is necessary before any definite opinion can be expressed.

CYCLOPSIDEA HARDYI, n. sp.

A small slender species with rounded head. Dorsum dark brown, under surface grey. Legs partly grey, partly yellowish-brown. Wings short, glass clear.

♂. Eyes dark reddish-brown, large and rounded, separated by about one-sixth of the head width; ocelli forming an equilateral triangle, placed on a small eminence surrounded by a deep furrow. Frons dark brown, covered with short, stout, rather sparse black hairs; there is a shallow transverse groove, beneath which the frons bulges slightly, about one-third of the frons length above the antennae; face grey, covered with longer and denser white hairs; no beard. Antennae small and inconspicuous, dark brown in colour, basal two segments with short, sparse, inconspicuous creamy hairs. Mouth parts and palpi pale yellow, inconspicuous.

Scutum and scutellum dark brown, covered with brown to creamy hairs, which are longer and denser and form a creamy fringe at the sides of the scutum. Postscutellum bulging prominently. Pleurae grey, with sparse long creamy hairs. Legs with femora yellow at base and at the knee, remainder grey; tibiae yellowish-brown, rather darker distally, some grey dorsally on fore tibia; tarsi brown. Wings short, glass clear; costa thickened from a little proximal to the end of Sc nearly to the tip of the wing. Owing to the absence of the hind angle of the wing, the halteres, which are longer than usual, are very prominent.

Abdomen long and slender, tapering posteriorly, but with prominent genitalia. Above, it is dark brown in colour and covered with sparse, rather long, creamy hairs. Venter grey, with white hairs. Genitalia as in Text-figure 17, c, d, e, f. The ninth tergite and sternite are divided into two parts by a median longitudinal

zone which is less heavily chitinized than the rest. As well as the three hooks (dorsal and ventral distal, and a dorsal one on the neck) on the distostyle shown in Text-figure 17, *d*, there is another on the medial side at the distal end.

Length, body 5 mm., wing 4.7 mm.

Holotype, the unique male from Inglewood, Queensland, 1st September, 1925, in the collection of Mr. G. H. Hardy. Named after the collector in recognition of this and many other kindnesses.

References.

- BEQUAERT, J., 1925.—New Nemestrinidae (Diptera) from Rhodesia and New Guinea. *Psyche*, xxxii, No. 1, pp. 18-22.
- BIGOT, J. M. F., 1881.—Diptères nouveaux ou peu connus. *Ann. Ent. Soc. France*, Ser. 6, t. 1, p. 12.
- HARDY, G. H., 1924.—Australian Nemestrinidae (Diptera). *Proc. Linn. Soc. N.S.W.*, xlix, Pt. 4, pp. 447-460.
- JAENNICKE, F., 1867.—Neue exotische Dipteren. *Abh. Senck. natur. Ges.*, vi, Pts. 3 and 4, p. 336.
- LICHTWARDT, B., 1909.—Beitrag zur Kenntnis der Nemestriniden. iii. Über indische und indo-australische Arten. *Deutsch. Ent. Zeitschr.*, 1909, Pt. 5, pp. 647-651.
- , 1910a.—*Id.* iv. Über australische Arten. *Deutsch. Ent. Zeit.*, 1910, Pt. 4, pp. 371-388.
- , 1910b.—*Id.* v. Über amerikanische Arten. *Deutsch. Ent. Zeit.*, 1910, Pt. 5, pp. 601-602.
- , 1912.—Die Dipterengattung Nycterimyia. *Entomol. Mitteil.*, i, Nr. 1, p. 26.
- , 1919*.—*Ann. Mus. Nat. Hung.*, xvii, p. 277.
- MACQUART, J., 1840.—Diptères exotiques nouveaux ou peu connus. ii.
- , 1846.—*Id.* Supplément 1.
- , 1850.—*Id.* Supplément 4.
- MATTHEW, W. D., 1915.—Climate and Evolution. *Ann. N. York Acad. Sci.*, xxiv, pp. 171-318.
- NEWMAN, E., 1841.—Entomological Notes. *The Entomologist*, i, p. 220.
- SCHINER, J. R., 1868.—Reise der Oesterrichischen Fregatte Novara um die Erde, etc. Zoologische Theil, i, Diptera, pp. 110-112.
- TAYLOR, T. GRIFFITH, 1919.—Climatic Cycles and Evolution. *Geog. Review*, viii, No. 6, pp. 289-328.
- THOMSON, 1869.—K. Sven. Fregettem Eugenies Resa omkring jorden. Diptera. pp. 476-477.
- TILLYARD, R. J., 1919.—The Panorpid Complex. Part iii. The Wing-venation. *Proc. Linn. Soc. N.S.W.*, xlv, Pt. 3, pp. 533-718.
- WALKER, F., 1849.—List of the Dipterous Insects in the British Museum. Part ii, pp. 231-235.
- , 1850.—*Insecta Saundersiana*, Pl. 5, fig. 4.
- , 1857.—Characters of undescribed Diptera in the Collection of W. W. Saunders, Esq., F.R.S., etc. *Trans. Ent. Soc. London*, n.s., iv, pp. 134-135.
- WANDOLLECK, B., 1897.—Monographie der Dipteren-Gattung *Colax* Wiedem. und *Trichopsidea* Westw. *Entomol. Nachrichten*, xxiii, No. 16, p. 241.
- WESTWOOD, J. O., 1835.—Insectorum nonnullorum exoticorum (ex ordine Dipterorum) Descriptiones. *Lond. and Edin. Phil. Mag. and Jl. of Sci.*, vi, pp. 447-449.
- , 1838*.—*Isis*, ii, p. 86.
- , 1839.—Description of a new Genus of Dipterous insects from New South Wales. *Trans. Ent. Soc. London*, ii, pp. 151-152.
- , 1848.—*The Cabinet of the Oriental Entomologist*. London, William Smith. p. 118, Pl. 18, fig. 5.
- WHITE, A., 1914.—The *Diptera-Brachycera* of Tasmania. Part i. *Pap. and Proc. Roy. Soc. Tasmania for 1914*, pp. 62-67.
- , 1916.—The *Diptera-Brachycera* of Tasmania.—Addenda et Corrigenda, Part i. *Pap. and Proc. Roy. Soc. Tasmania for 1916*, p. 260.
- WIEDEMANN, 1824.—*Analecta entomologica ex museo regio Havniensi*, p. 18.
- , 1830*.—*Aussereuropäische zweiflügelige Insekten*. p. 260.

WULP, VAN DER, 1886.—Diptera of Central Sumatra. Midden-Sumatra, etc. Deel iv, ged. i, afd. 9, p. 26. *Published by the Aardrijkskundig Genootschap.*

———, 1896.—Catalogue of the described Diptera from South Asia. p. 69.

* I have not seen these papers, the references being taken from Mr. Hardy's paper.

EXPLANATION OF PLATE L.

1, *Trichophthalma rosea* Macq., ♂, feeding on *Epacris microphylla*; 2, *T. rosea* Macq. ♀, on *Leptospermum* sp.; 3, *T. albimacula* Walk., ♂, on *E. microphylla*; 4, *T. primitiva* Walk., ♂, on *E. microphylla*. Photographs natural size from life.—A. J. Nicholson.

Addendum.

Mr. G. H. Hardy has asked me to call attention to and to correct the following errors in his paper on this family (PROC. LINN. SOC. N.S.W. xlix, 1924, 448-460):—

- p. 451, line 12—for *variosa*, read *variolosa*
- p. 451, line 26—for *albitarsis*, read *albibasis*
- p. 454, line 14—for *montanea*, read *monotaenia*
- p. 455, line 45—for *richardoae*, read *ricardoae*
- p. 456, line 15 and p. 448, line 48—for *Atriatops*, read *Atriadops*